

Technical Memorandum

Operable Unit 1 Demonstration Study Progress Report

April to August 2005

National Aeronautics and Space Administration, Jet Propulsion Laboratory, Pasadena, California

Final

October 7, 2005

This technical memorandum provides a summary of field, analytical, and operational data collected through August 31, 2005 for the Operable Unit 1 (OU-1) demonstration study system. The OU-1 system is being implemented as part of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) program at the National Aeronautics and Space Administration (NASA) Jet Propulsion Laboratory (JPL) in Pasadena, California.

This memorandum summarizes system performance based on the extracted and reinjected groundwater volumes, volatile organic compound (VOC) removal, and perchlorate removal. Other operational issues discussed include actions taken to monitor and mitigate sulfate reduction and hydrogen sulfide generation from the OU-1 system. The performance of the biomass removal and backwash recovery system during this time frame is discussed. An assessment has also been performed of water level and water quality data collected within the OU-1 target treatment zone. The following attachments are included:

- Attachment A. Field Monitoring Results
- Attachment B. Laboratory Analytical Results

System Performance Summary:

Table 1 summarizes the performance of the OU-1 system from April 1, 2005 through August 31, 2005. The performance is discussed below in terms of the extraction well flow rates, injection well flow rates, wastewater discharges, and the overall mass removal achieved:

- **Extraction.** The OU-1 system has been operated at an average extraction flow rate of 155 gpm and has extracted approximately 103 acre-ft of water through August 31, 2005. The flow rate from Extraction Well No. 1 (EW-1), the shallow well, has varied from 60 to 87 gpm with an average value of 65 gpm. The flow rate from EW-2 (the deep well) has varied from 67 to 97 gpm with an average value of 90 gpm.
- **Reinjection.** Sustained reinjection flow rates have been achieved at Injection Well No. 1 (IW-1) at a level up to 197 gpm with an average value of 116 gpm. The pressure at the IW-1 wellhead has ranged from 0 to 15 psi with an average value of 6 psi. Sustained reinjection flow rates have been achieved at IW-2 at a level up to 158 gpm with an average value of 67 gpm. The average flow rate for IW-2 is lower because it was receiving only 30% of the flow from May to July 2005. In August 2005, the balance was approximately 51% of the flow to IW-1 and 49% to IW-2. There was no measurable pressure at the IW-2 wellhead until August 24th with an average pressure of 8.4 psi through the end of August. It appears that air trapped in the well is causing the backpressure and Battelle has been releasing the air pressure on a weekly basis.

- **Wastewater Discharges.** The amount of wastewater discharged to the sanitary sewer during this operating period was 12,000 gallons, or approximately 0.04 acre-ft, which occurred on April 5, 2005.
- **Mass Removal.** The total cumulative chemical mass removed by the OU-1 system through the end of August 2005 was estimated at 304 lbs of perchlorate, 7.6 lbs of carbon tetrachloride (CCl_4), and 1.5 lbs of trichloroethene (TCE). Figure 1 shows the cumulative perchlorate removal over time for the OU-1 system. The mass removal estimates were based on the amount of groundwater extracted during each month from each well, the monthly average influent perchlorate concentration from each well, and the monthly average influent CCl_4 and TCE concentrations from each well.

Table 1. OU-1 System Operational Summary (Through August 31, 2005)

Parameter	Units	EW-1	EW-2	Total
Total Volume of Groundwater Extracted	Acre Feet	48.5	54.8	103.3
Total Volume of Wastewater to Sewer	Acre Feet	–	–	0.04
Mass of Perchlorate Removed	lbs	168	136	304
Mass of CCl_4 Removed	lbs	2.4	5.2	7.6
Mass of TCE Removed	lbs	0.5	0.9	1.5

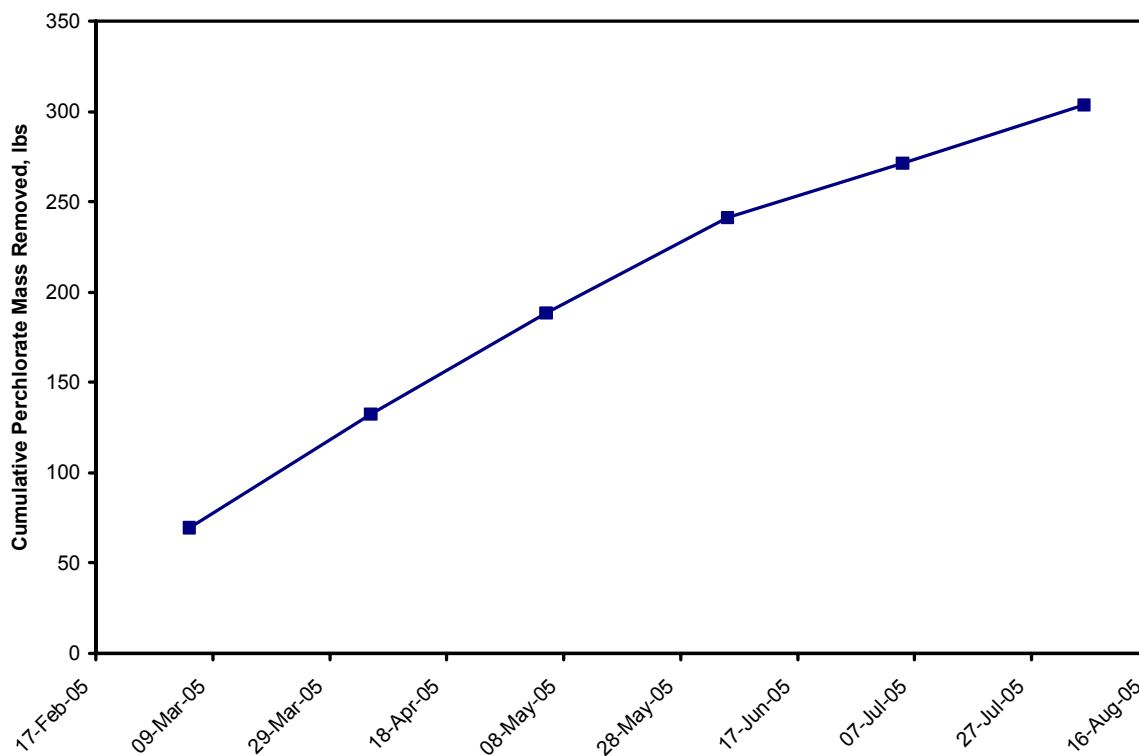


Figure 1. Cumulative Mass of Perchlorate Removed by the OU-1 System

VOC Removal by Liquid-Phase Granular Activated Carbon

The liquid-phase granular activated carbon (LGAC) vessels are used to remove VOCs from the groundwater and are arranged in a lead-lag configuration. Samples were analyzed for VOCs and 1,4-dioxane and were collected from each extraction well, the combined LGAC influent, the LGAC lead vessel effluent, and LGAC lag vessel effluent on a weekly basis (see Attachment B).

The total VOCs in the combined LGAC influent ranged from 14 to 65 $\mu\text{g/L}$ during this time period. CCl_4 represents the highest fraction of the influent total VOCs and ranged from <1.0 to 43 $\mu\text{g/L}$ during this time period. Figure 2 shows an overall declining trend in the influent total VOCs over time in both wells and in the combined influent. The VOC levels in EW-1 are lower than EW-2 and have declined at a faster rate with total VOC levels currently below 10 $\mu\text{g/L}$. Figure 2 also shows the breakthrough of the lead LGAC vessel which occurred for CCl_4 on August 10, 2005. This represents a capacity of approximately 29 million gallons or 11,500 bed volumes of groundwater processed before breakthrough of carbon tetrachloride. The lead LGAC vessel will be changed out and the lag vessel moved to the lead configuration. All VOCs present in the extracted groundwater were below the detection limit in the effluent from the lag LGAC vessel through August 31, 2005.

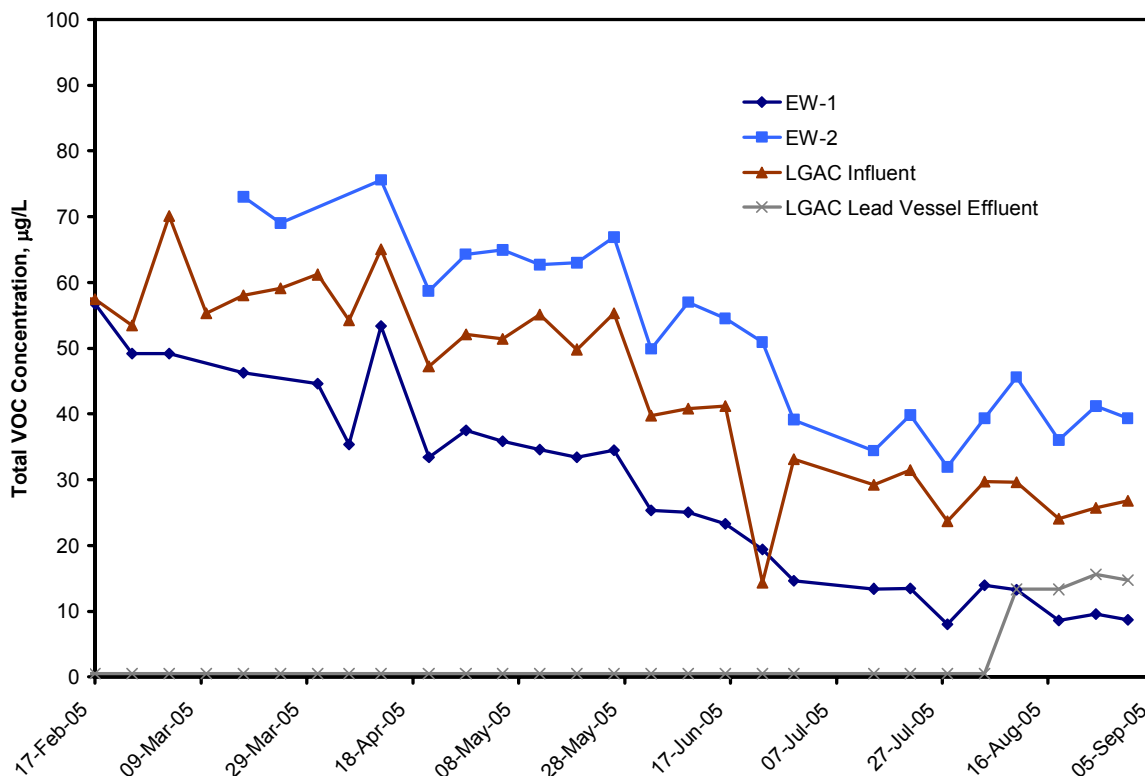


Figure 2. Total VOC Influent and Effluent Levels

There were 2 out of 21 sampling events where 1,4-dioxane was detected in the influent extracted groundwater above the 3 $\mu\text{g/L}$ detection limit (see Attachment B). However, the 1,4-dioxane detections were sporadic in nature and ranged from <3.0 to 7.4 $\mu\text{g/L}$ with an average influent value of non-detect through the time period. There were 2 out of 21 sampling events where 1,4-

dioxane was detected at the mid-point of the LGAC vessels on April 6, 2005 and April 12, 2005. Subsequently, there have been no detections of 1,4-dioxane at the mid-point of the LGAC vessels or in the extracted groundwater. All of the 1,4-dioxane levels were non-detect from the LGAC lag vessel through August 31, 2005.

Toluene was detected at the fluidized bed reactor (FBR) inlet from April 21, 2005 to July 28, 2005 (see Attachment B). It should be noted that toluene was not a constituent detected in the extracted groundwater or in the effluent of the lead LGAC vessel. The presence of toluene at the FBR inlet was attributed to the temporary use of a gasoline-powered sump pump in late April and early May to address the failure of the original sump pump installed for backwash recovery operations. The levels of toluene in the FBR influent during April/May ranged from 0.53 to 57 µg/L, but had declined to non-detect levels at the FBR inlet by August 4, 2005. The use of this temporary sump pump has been discontinued and a new sump pump was permanently installed on May 7, 2005.

Nitrate and Perchlorate Removal by the Fluidized Bed Reactor

Nitrate and perchlorate biodegradation occur within the FBR when the dissolved oxygen (DO) levels are low (<1 mg/L), the oxidation reduction potential (ORP) indicates reducing conditions, and there is an adequate supply of electron donor (acetic acid) and nutrients (urea/diammonium phosphate). The end products of treatment within the FBR are biomass, carbon dioxide, water, nitrogen, and chloride. A summary is provided below of nitrate and perchlorate removal in the FBR through August 31, 2005. Also discussed are data related to ORP conditions and sulfate reduction within the FBR.

During this timeframe, the total flow rate of the FBR has ranged from 1,019 to 1,287 gpm with an average value of 1,202 gpm. At an average value of 155 gpm for the forward feed, this represents an 87% recycle rate within the FBR. The fluidized bed height has ranged from 11.4 ft to 15.0 ft during this time frame.

Nitrate Removal. Figure 3 shows the nitrate levels in the extracted groundwater from EW-1 and EW-2 and in the combined plant influent over time. The figure also shows an overall declining trend in the level of nitrate in the plant influent from greater than 9 mg/L at the start of plant operations in February 2005 to levels close to 4 mg/L in August 2005. The dissolved oxygen, nitrate, and perchlorate levels in the extracted groundwater are the parameters which determine the acetic acid demand within the FBR. As the influent nitrate levels have dropped over time, the acetic acid levels have been manually adjusted on a weekly basis to match the changing influent conditions.

Figure 4 shows the influent and effluent nitrate levels across the FBR over time. It is important to optimize nitrate removal because nitrate-reducing conditions must be achieved before perchlorate removal occurs. As Figure 4 shows, the percentage of nitrate removal has varied from 72% to 96% with an average value of 87% depending on the influent nitrate levels and the acetic acid dose applied to the FBR. From April to August 2005, the nitrate level in the FBR influent has ranged from 3.4 to 6.4 mg/L with an average value of 4.7 mg/L. From April to August 2005, the nitrate level in the FBR effluent has ranged from <0.25 to 1.4 mg/L with an average value of 0.61 mg/L.

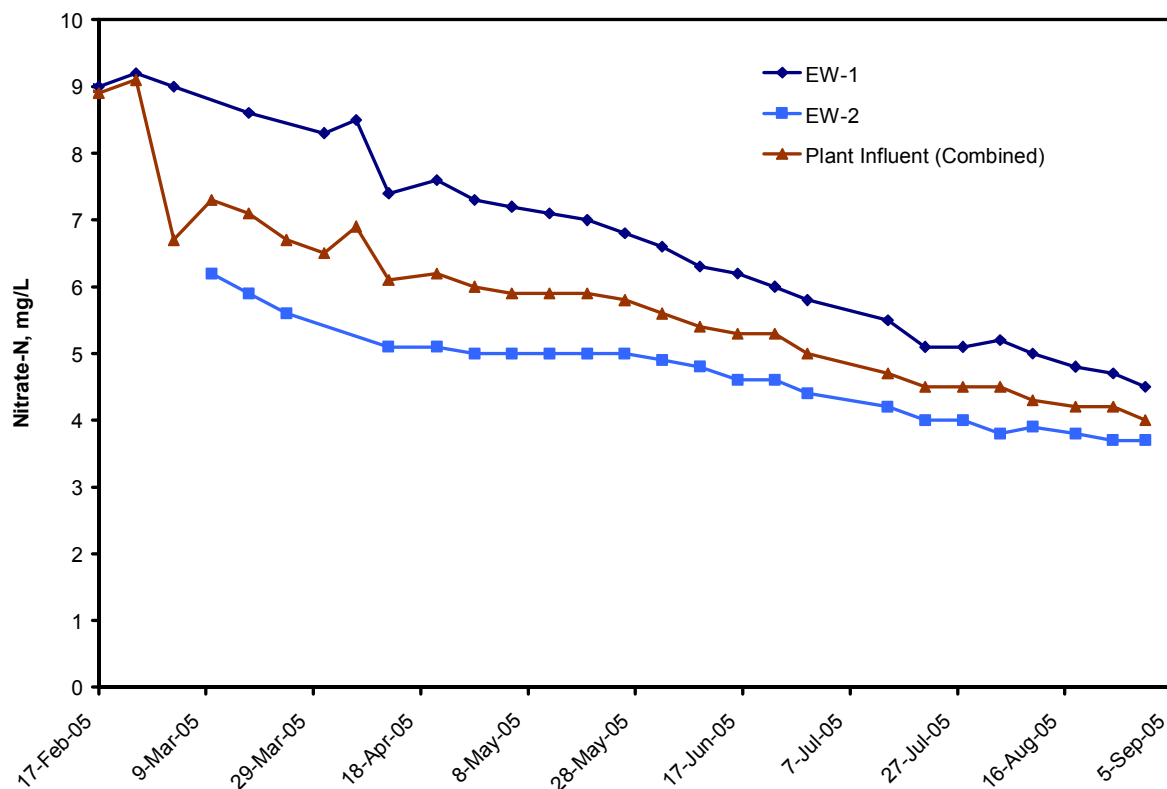


Figure 3. Influent Nitrate Levels at EW-1, EW-2, and Combined Plant Influent

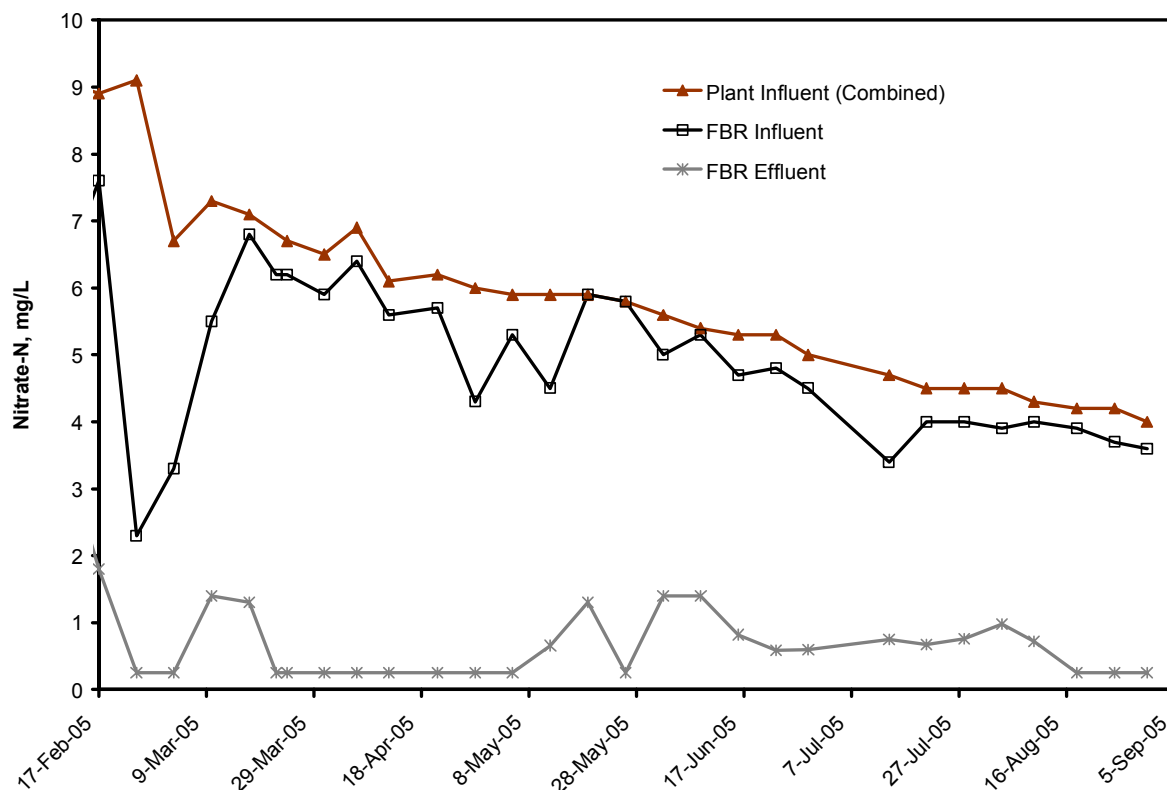


Figure 4. Nitrate Removal by the FBR

Perchlorate Removal. Figure 5 shows the perchlorate levels in the extracted groundwater from EW-1 and EW-2 and in the combined plant influent over time. Figure 5 shows an overall declining trend in the level of perchlorate in the plant influent from 2,300 µg/L in February 2005 to an average value of 614 µg/L in August 2005. EW-1 initially had slightly higher influent perchlorate levels than EW-2 in the extracted groundwater. However, the perchlorate levels within the two wells are now very similar with an average concentration of 582 µg/L for EW-1 and 628 µg/L for EW-2 in August 2005.

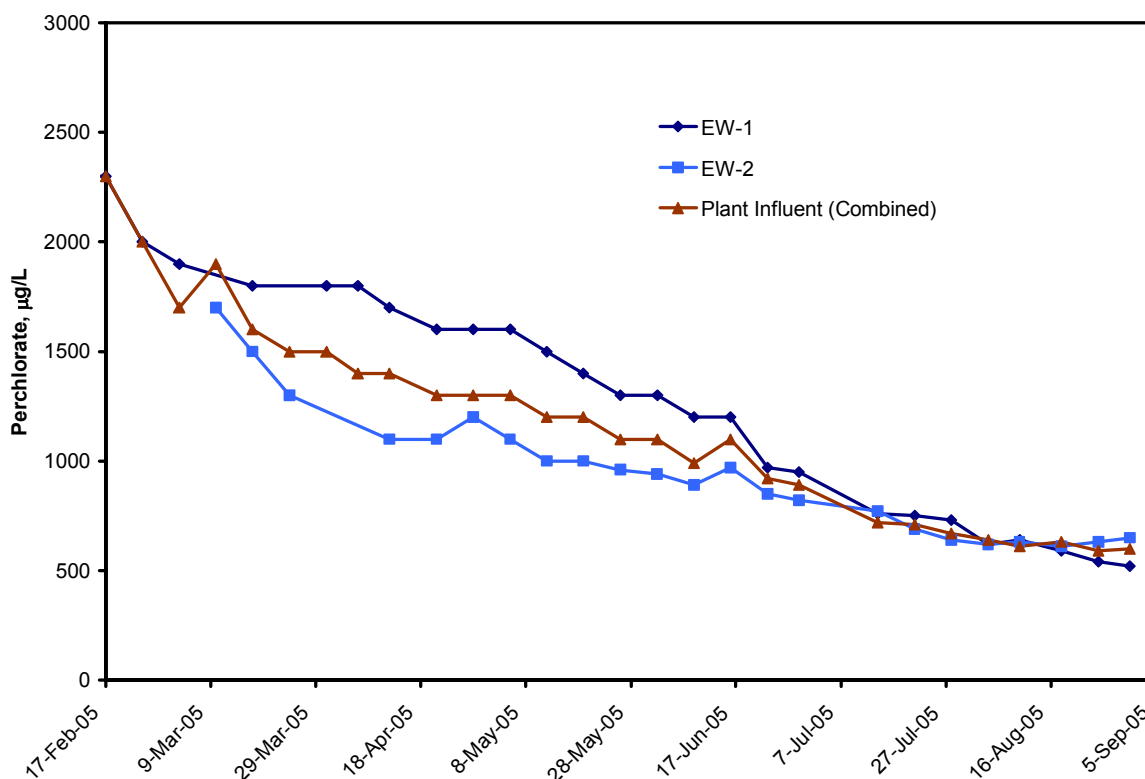


Figure 5. Influent Perchlorate Levels at EW-1, EW-2, and the Combined Plant Influent

Figure 6 shows the influent and effluent perchlorate levels across the FBR over time. The percentage of perchlorate removal was 100% with the exception of the timeframe from May 26, 2005 to June 16, 2005. During this time frame, the acetic acid dosage was set at 10 to 11 gallons per day (gpd) and was insufficient for complete perchlorate removal. During this time, the effluent perchlorate levels ranged from 410 to 610 µg/L, corresponding to a removal rate of approximately 60%. For the remainder of the operational period, the perchlorate concentration in the FBR effluent remained below the reporting limit of 2 µg/L.

The perchlorate reporting limit for the analytical laboratory is 2 µg/L using Method 314, but the laboratory's calibration procedure allows them to estimate detections in the range of 0.5 µg/L to 1 µg/L depending on the sample conductivity and other factors. The analytical laboratory has reported only one estimated detection of perchlorate at 1.6J on July 14, 2005, which occurred in the FBR effluent sample.

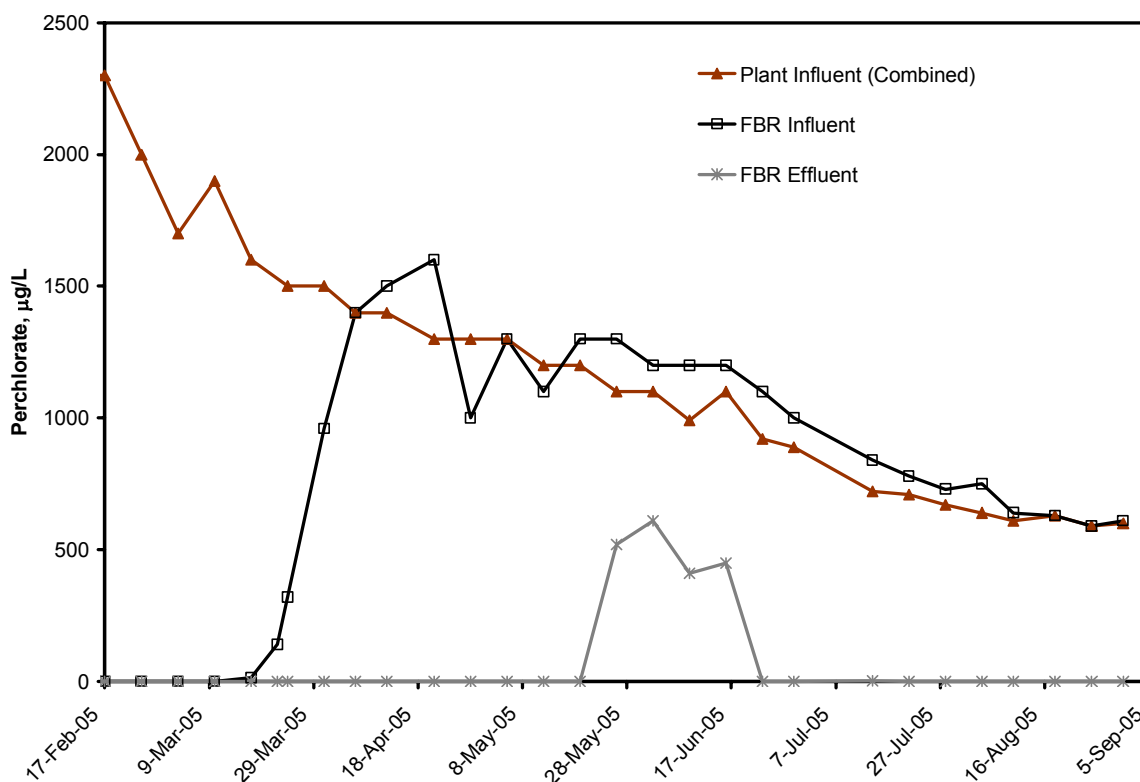


Figure 6. Perchlorate Removal by the FBR

Figure 7 shows the changes in acetic acid dosage to the FBR from April 2005 through August 2005. As the influent nitrate and perchlorate levels have dropped over time, the acetic acid levels have been manually adjusted on a weekly basis to match the changing influent conditions. The DO and nitrate levels in the extracted groundwater represent the majority of the acetic acid demand within the FBR. However, the declining perchlorate levels in the extracted groundwater also influence the target amount of acetic acid addition. The acetic acid adjustments and their impact on perchlorate removal are outlined below:

- From April 1, 2005 to May 19, 2005, perchlorate was removed to non-detectable levels at $<2 \mu\text{g/L}$ in the FBR effluent. During this timeframe, the acetic acid dosage ranged from 22 gpd to 12.5 gpd and was adjusted downward as influent nitrate and perchlorate levels declined. By April 4, 2005, the perchlorate at the influent of the FBR had reached full breakthrough from the LGAC vessels (see Figure 6). In early to mid-April 2005, the trend in the data indicated increasing biological activity within the FBR based on total organic carbon (TOC) in the FBR effluent and gradually declining ORP levels from -56 mV on April 4, 2005 to -108 mV on April 25, 2005 (see Figure 8). Initially, some fraction of the perchlorate removal was likely due to adsorption onto the FBR carbon media, but biological activity was indicated based on TOC effluent data, declining ORP readings, an increase in the FBR bed height, and visual observations of biological growth at the top of the FBR. In early to mid May, the ORP readings indicated stronger reducing conditions with an average value of -159 mV from May 2, 2005 through May 19, 2005 and complete perchlorate removal within the FBR (see Figure 8).

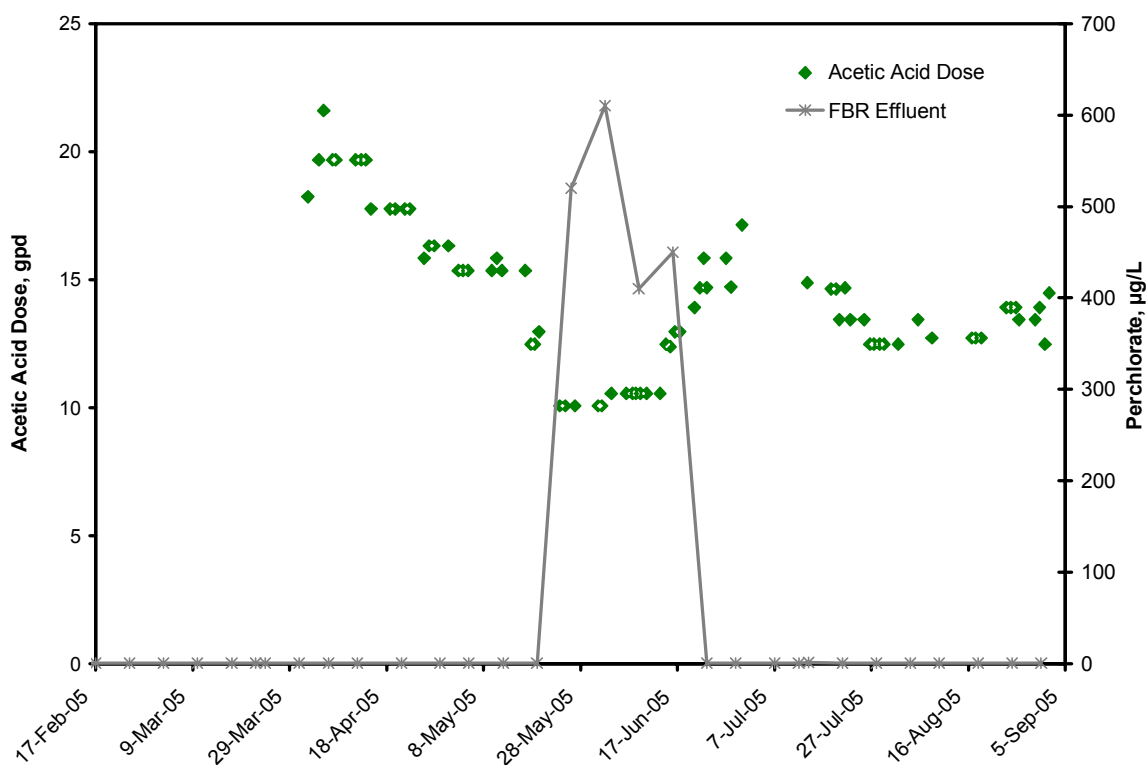


Figure 7. Acetic Acid Dosage Rate and FBR Effluent Perchlorate Levels

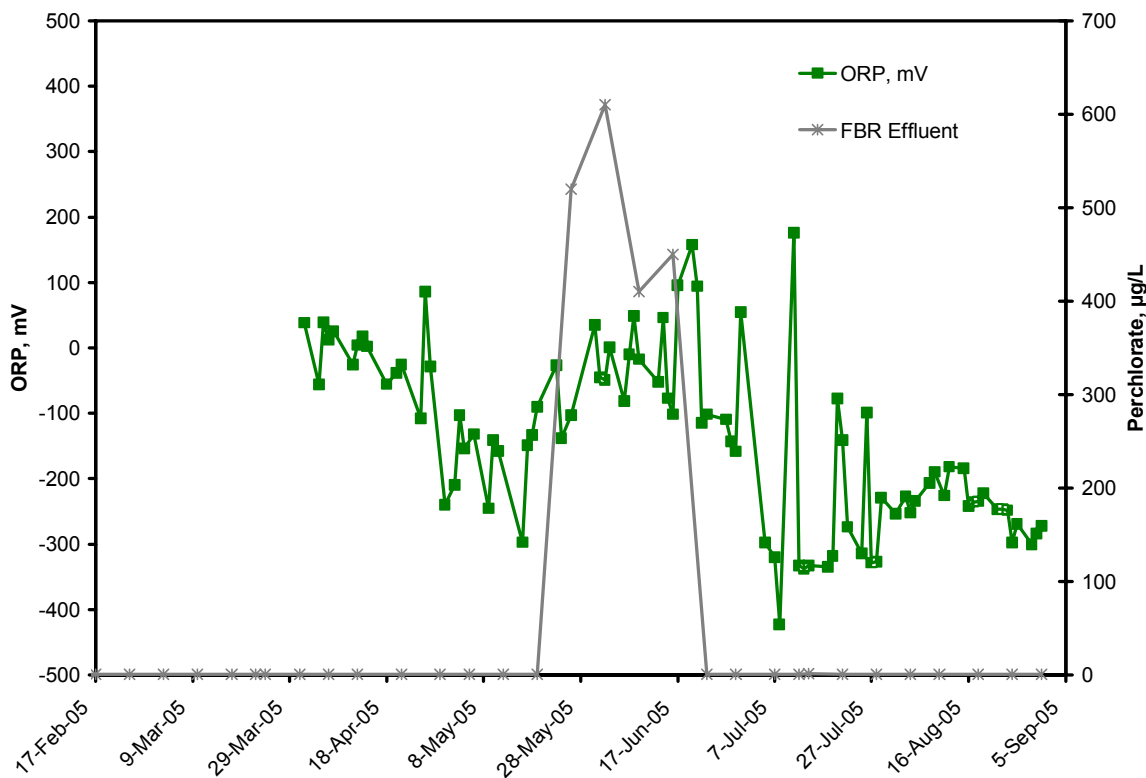


Figure 8. ORP Conditions and FBR Effluent Perchlorate Levels

- A decrease in acetic acid dosage was made in response to odor issues detected at the plant during the week of May 16, 2005 (see discussion below on sulfate reduction within the FBR). The acetic acid dose was reduced from 15.4 gpd to 12.5 gpd. From May 23, 2005 to June 1, 2005, the acetic acid dosage was further decreased to 10 gpd. Complete perchlorate removal was achieved through May 19, 2005; however, the perchlorate level in the FBR effluent increased to 520 $\mu\text{g/L}$ on May 26, 2005. Figure 8 shows the corresponding changes within the FBR and the increase in ORP levels to a range of approximately -138 mV to 35 mV during this time frame.
- From June 3, 2005 to June 13, 2005, the acetic acid dosage was increased to 11 gpd and the corresponding ORP levels within the FBR were in the range of -81 mV to 49 mV. During this time period, incomplete nitrate and perchlorate removal was experienced and ORP levels were relatively elevated in comparison to ORP conditions in early May.
- Subsequently, the acetic acid dosage was increased gradually to 14 gpd on June 20, 2005. By June 23, 2005 complete perchlorate removal to non-detectable levels ($<2 \mu\text{g/L}$) was restored within the FBR based on laboratory analytical sampling results. The FBR effluent levels have remained at non-detectable levels through August 31, 2005.

Based on a review of the ORP measurements, the optimal ORP range for nitrate and perchlorate removal appears to be within the -140 mV to -240 mV range. In order to avoid future operational issues associated with under dosing of the acetic acid, the turnaround time on the laboratory samples for the FBR effluent has been reduced from two weeks to 48-hours to allow for faster confirmation of operating conditions.

ORP Conditions and Sulfate Reduction. Under normal operations, the biological treatment unit at the OU-1 treatment plant will convert small amounts of natural sulfate in the groundwater to dissolved hydrogen sulfide (H_2S). During certain upset conditions, larger amounts of H_2S can be generated. Hydrogen sulfide can create a noticeable odor at a threshold value of 0.001 ppmv in the ambient air.

Figure 9 shows the relationship between ORP levels and total sulfide in the FBR effluent, which is a product of sulfate reduction. The total sulfide measurement is completed on-site using a Hach™ spectrophotometer which indicates the total quantity of H_2S , HS^- , and metal sulfides in a sample. Based on the pH of the treated water, it is assumed that the majority of the total sulfide is present in the form of H_2S . Two events occurred during this operational period where a significant level of sulfate reduction occurred within the FBR and resulted in a noticeable odor within the vicinity of the treatment plant.

- On May 16, 2005, the acetic acid dose was 15.4 gpd, the ORP level within the FBR was -297 mV, and the total sulfide concentration in the FBR effluent was 247 ppb (see Figure 9). The odor issue was addressed through a subsequent decrease in the acetic acid dose from 15.4 gpd on May 16, 2005 to 12.5 gpd on May 17, 2005 to increase the ORP levels within the FBR. The following week the acetic acid dose was further reduced to 10 gpd, which resulted in an over correction and subsequently incomplete perchlorate removal as discussed above.

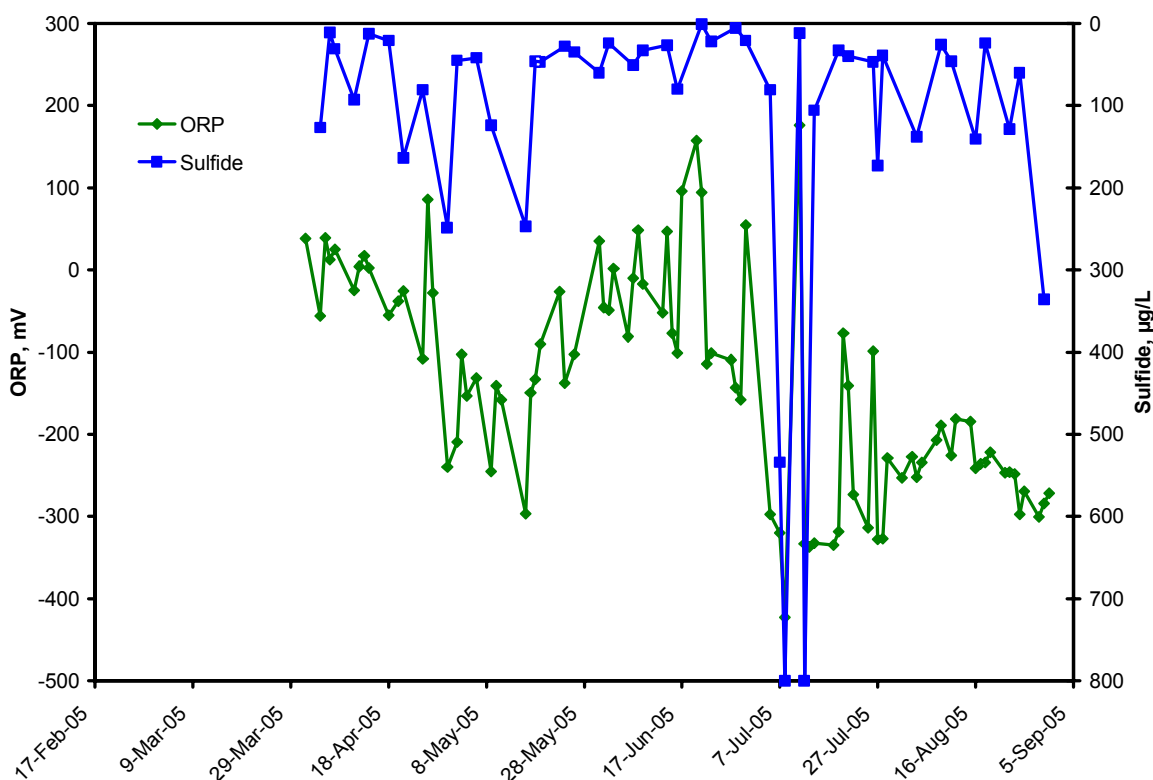


Figure 9. ORP Conditions and Sulfide Concentration within the FBR

- The second event occurred during the week of July 11, 2005 and followed the FBR system shutdown from July 7, 2005 to July 12, 2005 related to a malfunction of the blower on the Trimite™ filter. Three sulfide readings were taken during the week of July 11, 2005 with the following results: 11.7 µg/L on July 11, “over-range” on July 12, and 106 µg/L on July 13 (see Figure 9). The “over-range” reading on July 12, 2005 would indicate a concentration in excess of 800 µg/L, which is the upper range of the field instrument. This event was addressed through a decrease in the acetic acid dosage. The acetic acid dosage was adjusted down from 15 gpd on July 13, 2005 to 14.6 gpd on July 18, 2005 to 13.4 gpd on July 20, 2005. The ORP levels within the FBR subsequently increased from -338 mV on July 13, 2005 to -141 mV on July 21, 2005. The sulfide reading in the FBR effluent decreased to 40 µg/L on July 21, 2005.

Figure 9 shows that as the ORP levels within the FBR approach -240 mV, the FBR achieves sulfate reducing conditions and sulfide is produced at levels from 100 to >800 µg/L in the FBR effluent based on Hach™ field readings. Figure 9 also shows that detectable levels of sulfide are also produced at ORP levels above -240 mV, but the sulfide levels typically remain below 100 µg/L in the treated water.

Two actions have been taken to further monitor and mitigate the effect of sulfate reducing conditions at the OU-1 system. First, hydrogen sulfide levels in ambient air are monitored on a daily basis, five days a week at various locations within the plant and around the site perimeter. During the initial odor investigation on July 18, 2005, the hydrogen sulfide emissions were non-detect at all locations except the aeration tank overflow line. Second, on August 20, 2005 the

aeration tank vent line was reconfigured to allow for the installation of two vapor phase GAC drums in series to remove any hydrogen sulfide emissions. This modification also included installing a water trap at the aeration tank overflow line.

Biomass Removal and Backwash Water Recovery

The biomass removal and backwash recovery system consists of the Trimite™ filter, the backwash sump, and the clarifier. The filter helps to recover biomass solids and to reduce the turbidity of the reinjected treated water to protect the injection wells. Figure 10 shows the effluent turbidity over time from the filter based on Hach™ turbidimeter readings. The effluent turbidity from the filter has ranged from 0.09 to 3.4 nephelometric turbidity units (NTU) with an average value of 0.57 NTU from April to August 2005. In comparison, wells are typically developed until the recovered groundwater maintains a turbidity of less than 4 NTU.

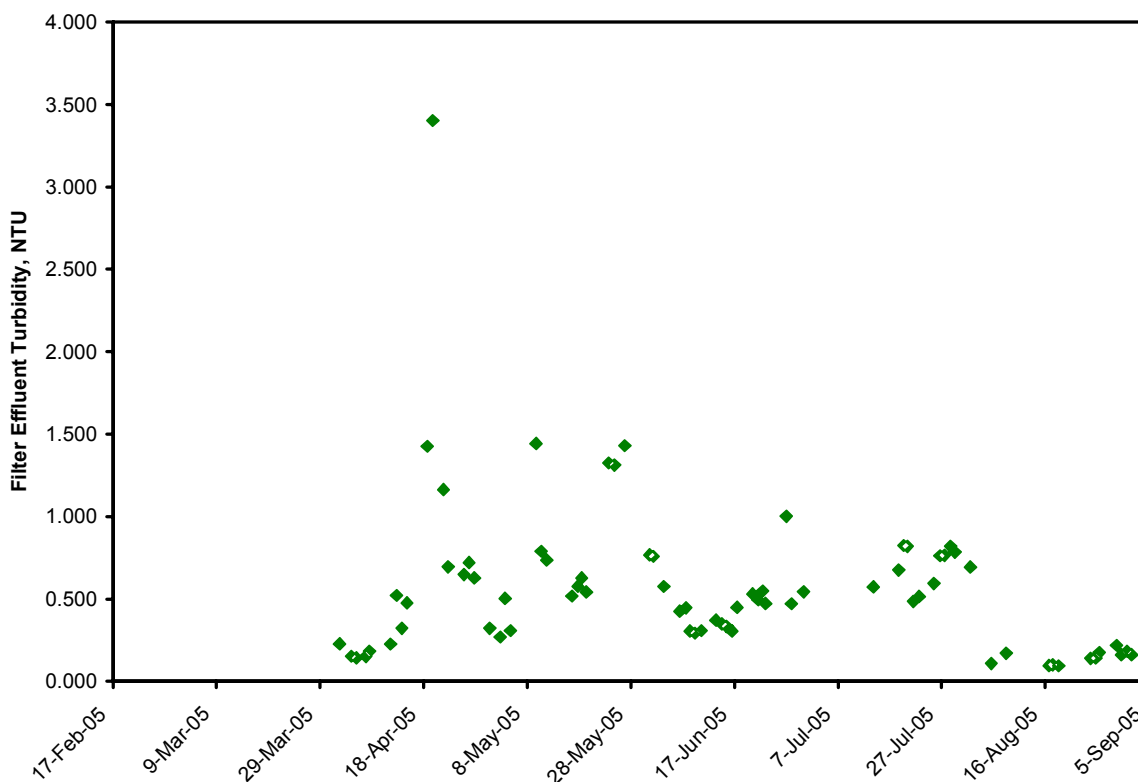


Figure 10. Trimite™ Filter Effluent Turbidity

Table 2 shows the total suspended solids (TSS) load from the FBR to the filter which has ranged from 11 to 205 lbs/day. The TSS concentrations entering the filter have ranged from 6 to 110 mg/L with an increasing value in August 2005. The TSS concentrations in the filter effluent have ranged from <4 to 6.5 mg/L and the corresponding TSS removal rate has ranged from 33% to 96%. In comparison, the influent TSS in the extracted groundwater ranged from <4 to 7.0 mg/L.

Table 2. Summary of Biomass Solids Removal from Trimite™ Filter

Date	Filter Influent TSS, mg/L	Filter Influent TSS, lbs/day^(a)	Filter Effluent TSS, mg/L	Filter Effluent TSS, lbs/day	Percent Removal
4/28/05	56	104	<4.0	<7	93%
5/26/05	28	52	4.0	7	86%
6/23/05	17	32	6.5 ^(b)	12	62%
7/21/05	6	11	<4.0	<7	33%
8/18/05	110	205	<4.0	<7	96%

(a) Based on an average flow rate of 155 gpm and 24 hour per day operation.

(b) Based on the average value of 9.0 mg/L and <4.0 mg/L in the sample and duplicate.

The backwash water from the Trimite™ filter is sent to the sump for storage and returned to the FBR inlet after the biomass solids settle out in the clarifier. Several issues were encountered with the operation of the backwash recovery system during this time frame as summarized below.

In late April, the original 1.5 HP backwash sump pump was not able to maintain flow, which resulted in high level alarms within the OU-1 system. A temporary gasoline powered sump pump was used from late April to early May. A larger replacement pump was installed on May 7, 2005. After use of the temporary sump pump, toluene was detected in the clarifier solids and return water to the FBR inlet. The level of toluene in the clarifier solids was measured at 0.19 to 1.24 mg/L. The clarifier wastewater from this batch was pumped to tank T-202 to be retreated through the LGAC to remove the toluene in the wastewater fraction. The solids were collected at the bottom of T-202 (a slant-bottom tank) for off-site disposal.

A jar test was conducted on May 24, 2005 to determine polymer dosing to the clarifier. The vendor recommended a 4 mg/L dose of a high-charge cationic polymer (Polydyne C-6264) for use in the clarifier to improve settling of the biomass solids. USFilter was on-site on June 21, 2005 for shakedown of the chemical feed system for the clarifier and Trimite™ filter. From July 1, 2005 to July 5, 2005, the polymer pump was run to the clarifier. Polymer addition was ceased on July 5, 2005 due to an accumulation of a sticky sludge floating on the surface of the clarifier. The clarifier was drained to tank T-202 and manually cleaned on July 5, 2005 to restore proper operation.

The Trimite™ filter operation and maintenance (O&M) manual recommends the use of polymer as a filter aid within the clarifier and mixed media filter. The recommended dosage ranges from 0.05 mg/L for waters having low turbidity to 0.5 mg/L (or occasionally higher for turbid water). The polymer pump on the Trimite™ filter was also run briefly to test its operations on June 31, 2005, but was not started up for on-going use. Subsequent to this start-up test and the polymer start-up to the clarifier, the filter experienced several operational problems. The adsorption clarifier located within the Trimite™ filter experienced excessive flushing. High pressures within the adsorption clarifier led to the loss of some adsorption clarifier media through the sides of the retention screen. On July 7, 2005, the blower used for air sparging of the adsorption clarifier and filter failed and the OU-1 system was placed into recycle mode from July 7, 2005 to July 12, 2005. A replacement blower was procured and installed on July 12, 2005.

The adsorption clarifier was manually cleaned on July 9, 2005 to July 10, 2005 to restore its proper operation and the retention screen was repaired to minimize further media loss.

Polymer addition was implemented for five days in July 2005 but has been discontinued at this time. The use of polymer and/or a coagulant aid in the clarifier will be further assessed on an as needed basis. In order to improve overall operation of the backwash recovery system, the current approach is to discharge the clarifier solids more frequently at a rate of approximately once every two weeks.

Water Level and Water Quality Assessment

Groundwater level elevation and chemical data were used to investigate the impact of the OU-1 system operations on local aquifer conditions. Groundwater level elevation data has been collected quarterly from the NASA JPL monitoring wells and transducers are used to record data from the extraction wells. In addition, groundwater levels are collected on a weekly basis from NASA-JPL monitoring wells MW-7, MW-8, MW-13, MW-16, and IRZ-IW2 as part the OU-1 system operations.

Historic elevation data (April 2004) indicate a steep southwest gradient from the mouth of the Arroyo Seco to the OU-1 system area coupled with a southeast gradient from the northwest of the JPL facility. Flow converges to the south of the treatment system and migrates toward the south/southeast under a reduced gradient (Figure 11). The groundwater elevation contour map showing conditions after system startup (Figure 12) indicates groundwater flow is significantly affected by operation of the system, with a drawdown of roughly 25-30 ft observed in the extraction wells. Although no groundwater level elevation data is available from the injection wells, it appears that that extraction wells will effectively contain groundwater within a 150-ft radius of the extraction wells and the groundwater injected upgradient at IW-1 and IW-2. Graphs of historical groundwater level elevation data in select wells (Figure 13) show a significant seasonal fluctuation and also indicate a significant rise in elevation in the spring of 2005 that is likely due to increased recharge from precipitation. Groundwater levels observed in July 2005 declined from the April 2005 high level, but are still at or near historical high levels (see Figure 13 and Figure 14). Table 3 compares data from the three previous spring sampling events (to eliminate seasonality effects) and shows minimal difference between the 2003 and 2004 data and a fairly uniform 20-ft increase in groundwater elevation between the 2004 and 2005 data across the regional aquifer.

Isoconcentration contour maps are provided for TCE, CCl₄, perchlorate, and nitrate for baseline conditions before extraction (July/August 2004) and after extraction (July/August 2005) as Figures 14 through 18. Significant decreases are observed in these chemicals near MW-7 and MW-24, which are within the Phase I OU-1 target treatment zone (i.e., located between the extraction wells and injection wells). This also corresponds to the decreasing trend in chemicals in the extracted groundwater. The TCE levels also decreased in MW-16 and MW-13 located to the west in the proposed area. However, the CCl₄ and perchlorate levels increased in MW-16 and MW-13 compared to baseline conditions. The increase in chemical concentrations in the two wells is attributed to increased recharge and the historically high groundwater table coming into contact with chemicals previously trapped in the unsaturated zone. The chemicals have declined or remained the same in the wells near the facility's eastern boundary (MW-11) and western boundary (MW-22 and MW-23).

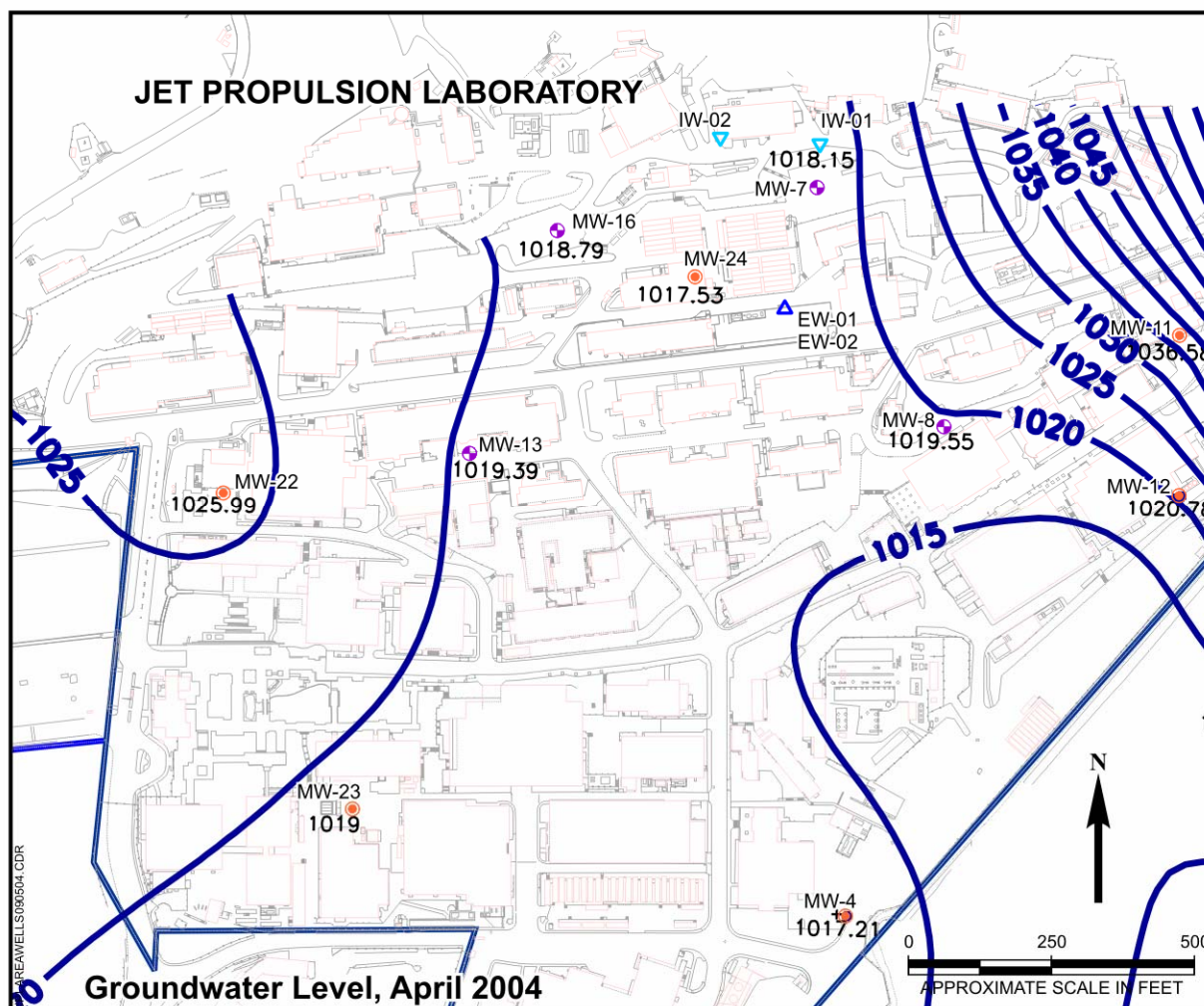


Figure 11. Groundwater Contour Map April 2004 (Baseline Before Extraction)

Table 3. Summary of Groundwater Level Elevation Difference in April Monitoring Events

Statistic	Difference Between April 2004 and April 2003 in all JPL Shallow Screened Monitoring Wells (ft)	Difference Between April 2004 and April 2003 in Nine Wells in OU-1 Area (ft)	Difference Between April 2005 and April 2004 in all JPL Shallow Screened Monitoring Wells (ft)	Difference Between April 2005 and April 2004 in Nine Wells in OU-1 Area (ft)
Average	1.54	0.92	20.41	22.36
Median	0.35	0.61	23.05	24.52

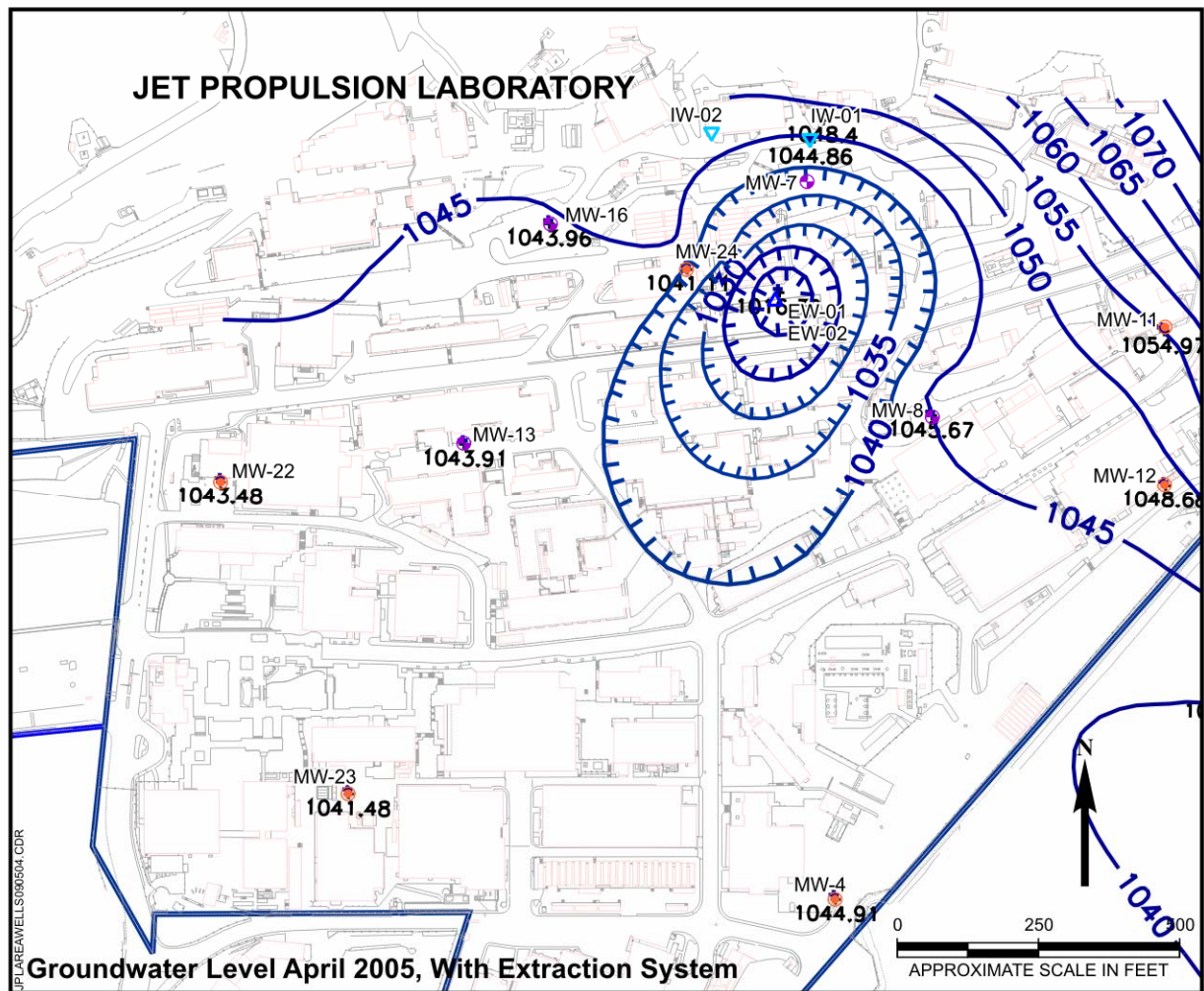


Figure 12. Groundwater Contour Map April 2005 (With Extraction)

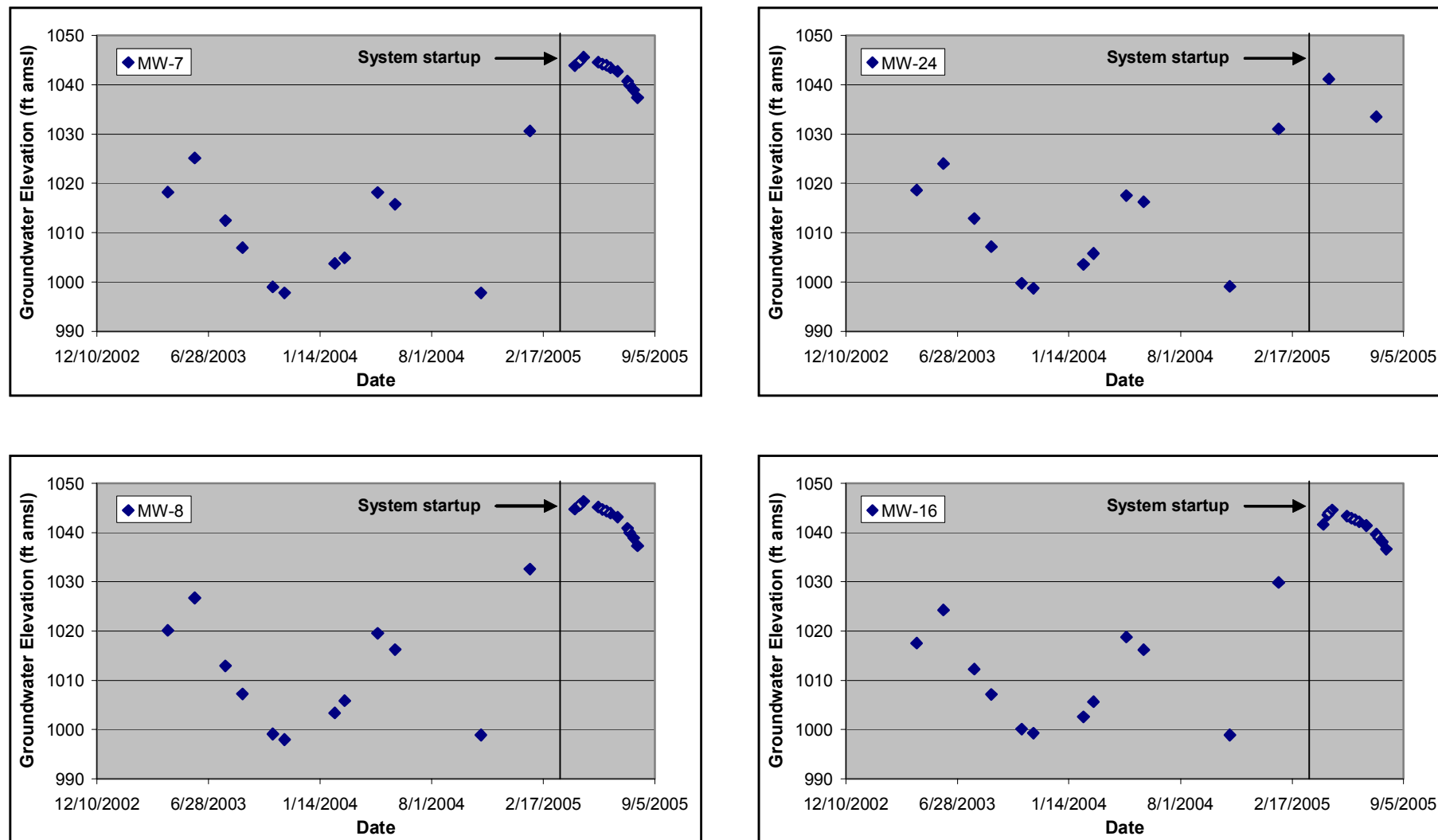


Figure 13. Historical Groundwater-Level Elevations in MW-7, MW-8, MW-24, and MW-16

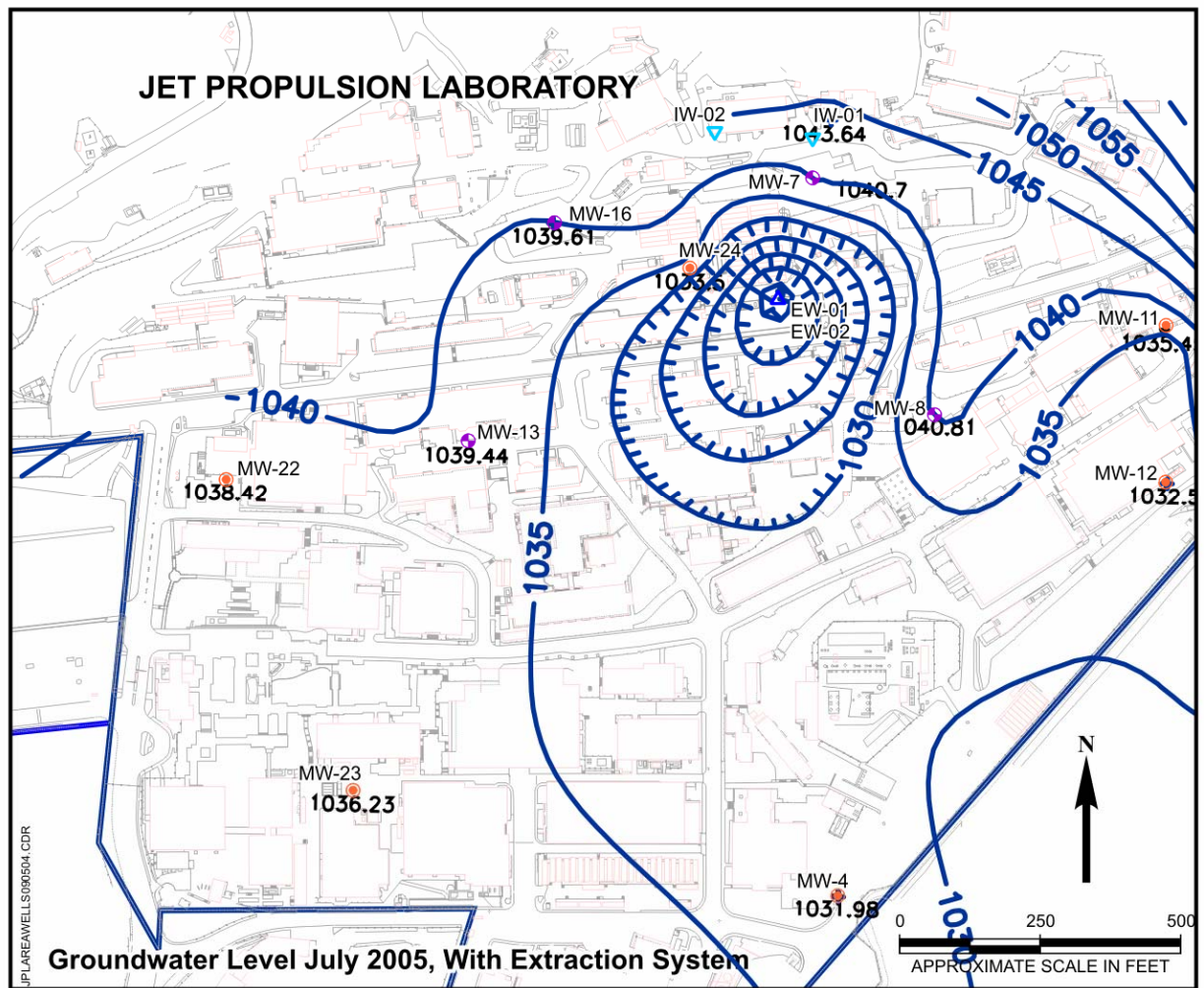


Figure 14. Groundwater Contour Map July 2005 (With Extraction)

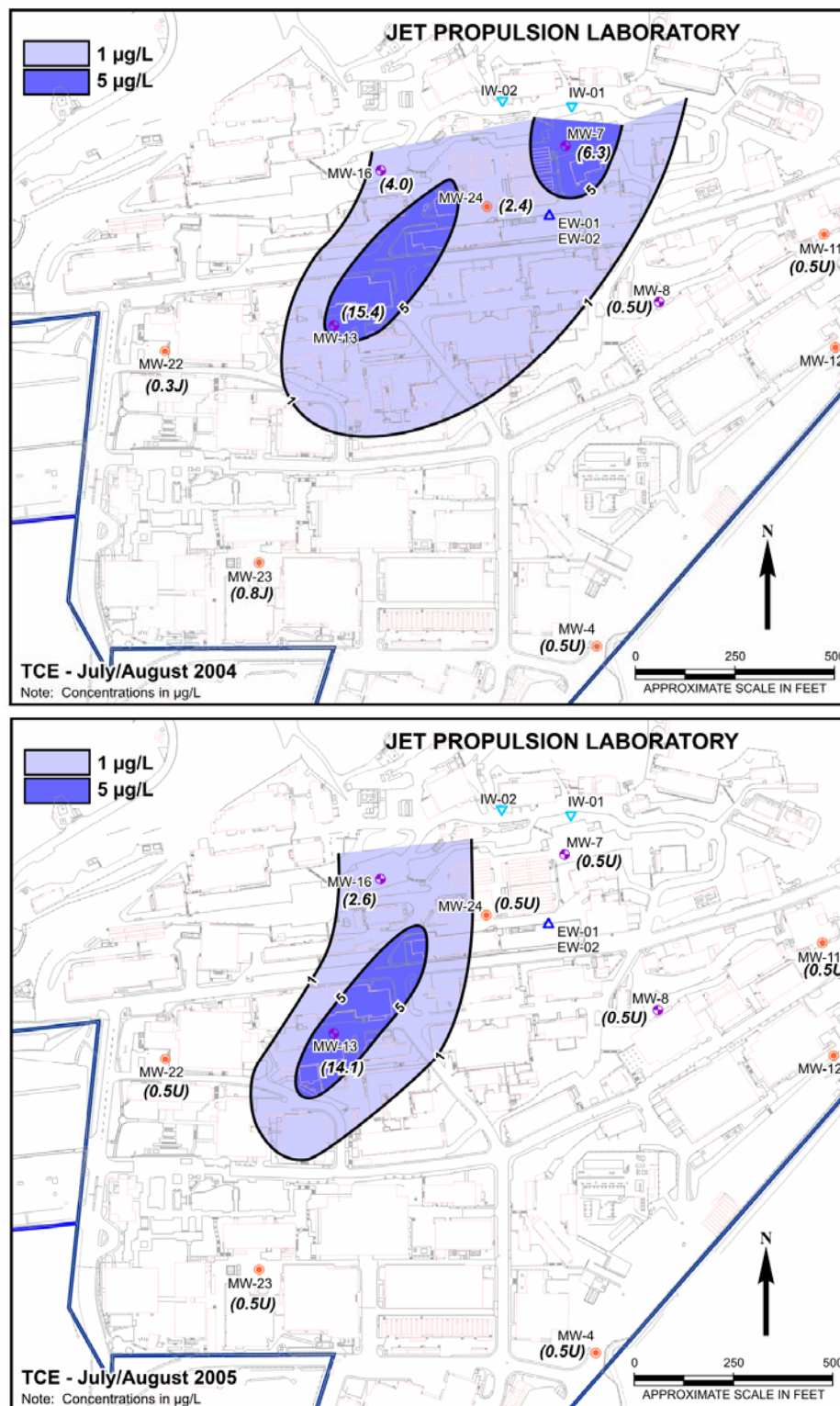


Figure 15. TCE in Groundwater Before (July/August 2004) and After Extraction (July/August 2005)

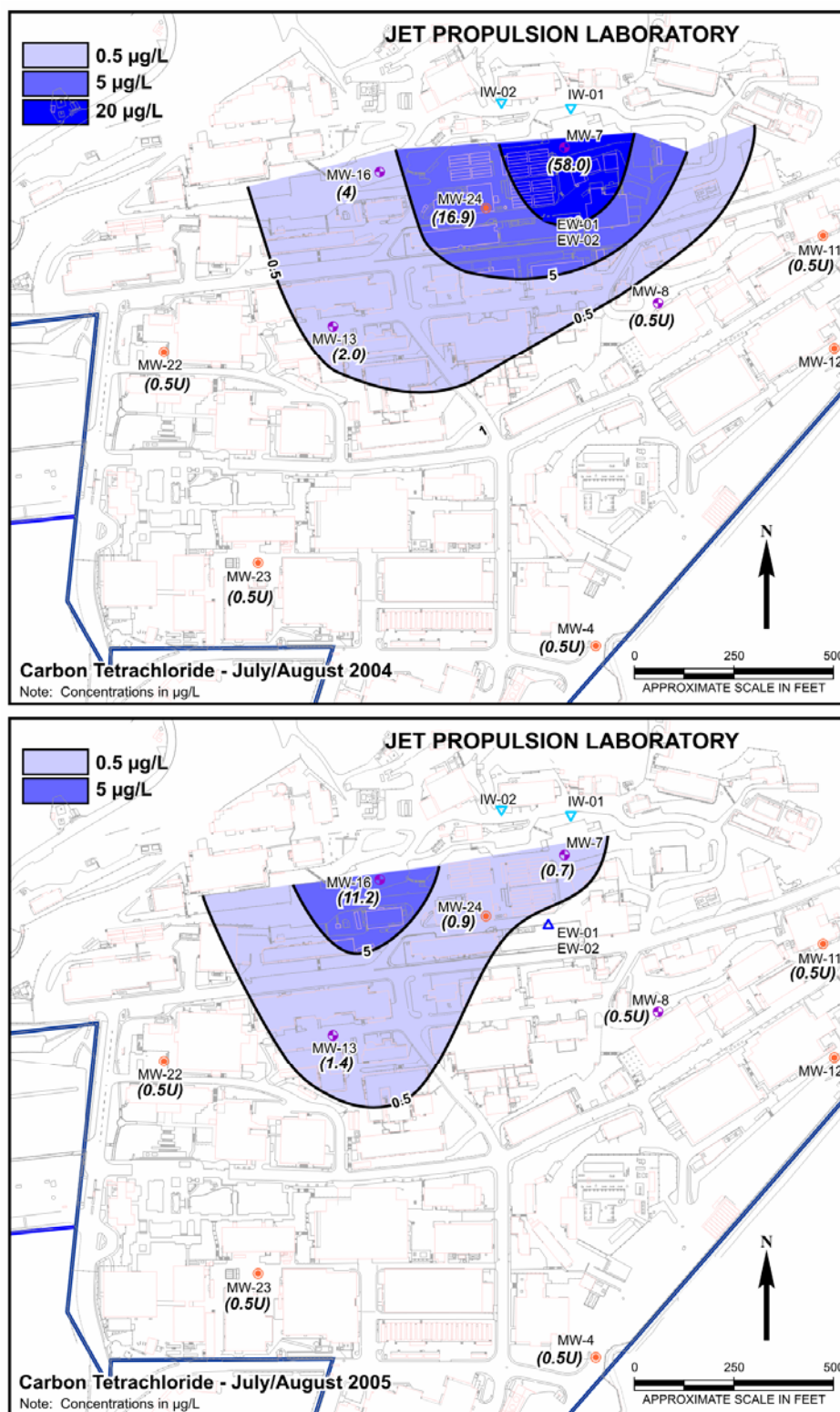


Figure 16. CCl₄ in Groundwater Before (July/August 2004) and After Extraction (July/August 2005)

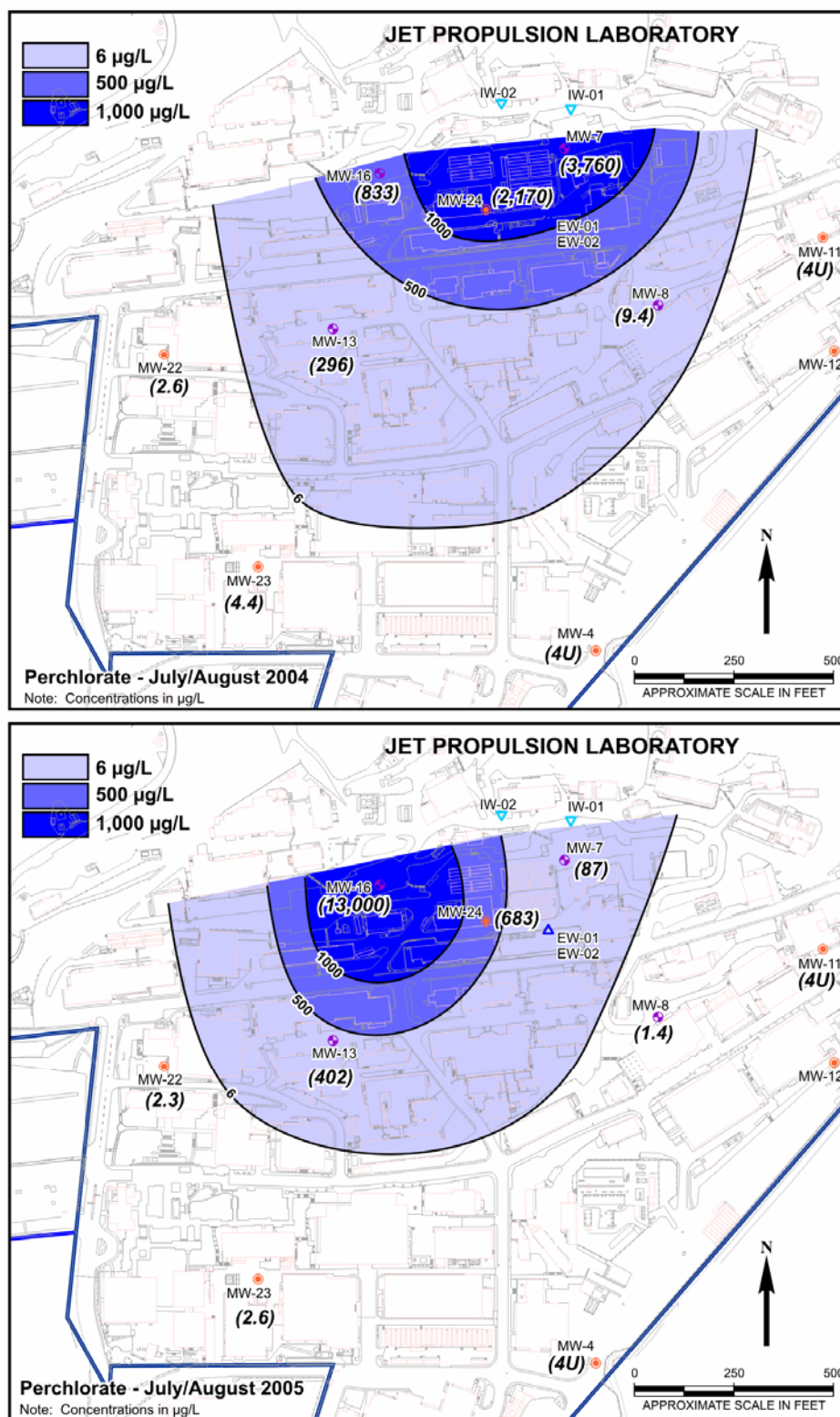


Figure 17. Perchlorate in Groundwater Before (July/August 2004) and After Extraction (July/August 2005)

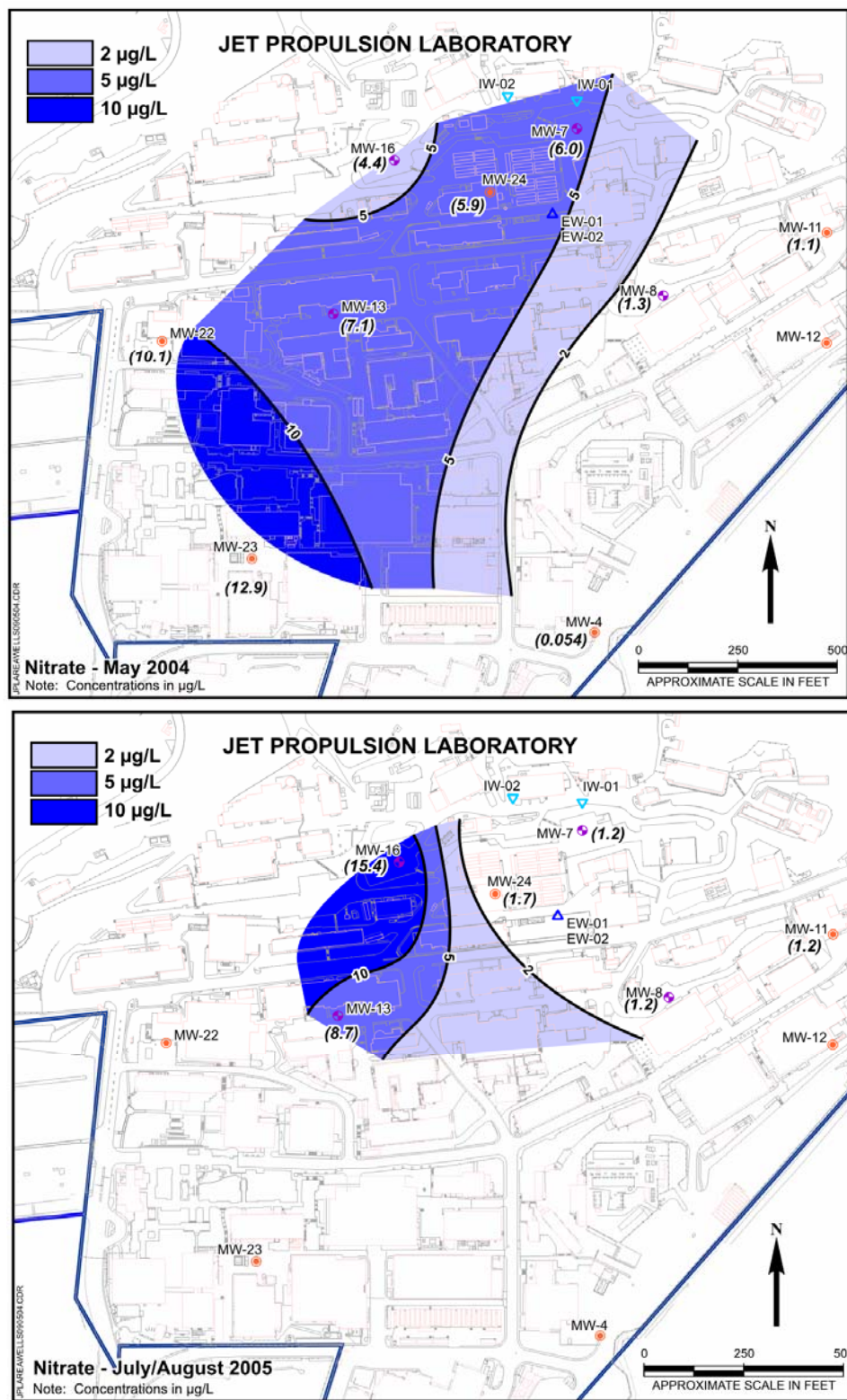


Figure 18. Nitrate in Groundwater Before (May 2004) and After Extraction (July/August 2005)

Conclusions and Recommendations:

Conclusions and recommendations associated with the OU-1 system performance during the April to August 2005 time frame is provided below:

- Approximately 7.6 lbs of carbon tetrachloride and 1.5 lbs of trichloroethene have been removed through August 31, 2005. VOC removal to non-detectable levels has been achieved at the effluent of the lag LGAC vessel through August 31, 2005. The lead LGAC vessel reached breakthrough for carbon tetrachloride on August 10, 2005 and will be changed out in October 2005.
- Approximately 304 lbs of perchlorate have been removed since the start-up of OU-1 system. The perchlorate removal was 100% for 29 out 33 sampling events since system start-up. Under dosing of acetic acid and incomplete perchlorate removal (at an average of 60% removal) was experienced from May 26, 2005 to June 16, 2005. Between June 23, 2005 and August 31, 2005, complete perchlorate removal has been achieved by the FBR. The perchlorate results from the FBR effluent are now received on a 48-hour turnaround basis to improve response time to changing process conditions.
- Two events occurred during this timeframe in which sulfate reduction within the FBR resulted in noticeable odor issues at the plant. Sulfate reduction appears to occur at a significant level below an ORP value of -240 mV within the FBR. To mitigate odor issues at the plant, a vapor phase LGAC system was installed on the vent line of the aeration tank and a water trap was installed on the aeration tank overflow line on August 20, 2005. H₂S levels in the ambient air are also measured on a daily basis at points within and nearby the OU-1 plant.
- The frequency of the discharge of biomass solids from the clarifier has been increased to approximately once every two weeks to optimize solids handling and to reduce the amount of solids returning to the influent of the FBR. The use of polymer and/or a coagulant aid in the clarifier has been discontinued at this time, but will be further assessed on an as needed basis.
- A significant decrease in chemical concentrations has been observed in the vicinity of MW-7 and MW-24, which are located within the OU-1 system target treatment zone. The increase in chemical concentrations in MW-16 and MW-13, located outside the target treatment zone is attributed to increased recharge and the historically high groundwater table coming into contact with chemicals previously trapped in the unsaturated zone.

Attachment A
Field Monitoring Results

Table A-1. OU-1 On Site Water Quality Log Comparison Sheet FBR Influent and Effluent

Date	DO In	DO Out	ORP In	ORP Out	ClO4 In ^a	ClO4 Out ^a	Nitrate-N In	Nitrate-N Out
d/m/y	mg/L	mg/L	mV	mV	mg/L	mg/L	mg/L	mg/L
1-Apr-05	4.87	0.30	91.9	38.4	1.70	0.06 ^a	2.6	0.0
4-Apr-05	4.03	0.22	75.5	-56.2	2.10	0.07 ^a	3.6	0.0
5-Apr-05	4.71	0.91	74.2	39.0	0.41	0.05 ^a	1.0	0.1
6-Apr-05	5.08	0.34	61.4	12.3	1.80	0.03 ^a	3.1	0.2
7-Apr-05	4.73	0.22	79.4	25.1	2.10	0.06 ^a	3.4	0.0
11-Apr-05	3.31	0.29	68.2	-25.2	2.50	0.07 ^a	3.3	0.1
12-Apr-05	3.50	0.37	66.5	4.4	2.60	0.07 ^a	3.3	–
13-Apr-05	5.01	0.67	78.6	17.4	2.80	0.07 ^a	2.4	0.1
14-Apr-05	6.10	0.38	62.1	2.5	2.50	0.07 ^a	2.8	0.1
18-Apr-05	6.01	0.27	71.4	-55.4	2.50	0.07 ^a	3.2	0.1
20-Apr-05	4.29	0.25	6.8	-38.1	2.50	0.08 ^a	2.5	0.0
21-Apr-05	4.48	0.23	17.2	-25.4	2.60	0.08 ^a	3.5	0.0
25-Apr-05	5.53	0.27	50.7	-108.2	2.70	0.07 ^a	3.7	0.1
26-Apr-05	3.89	0.20	-19.7	85.9	1.30	0.09 ^a	1.2	0.0
27-Apr-05	5.37	0.21	61.9	-28.3	2.70	0.07 ^a	3.1	–
30-Apr-05	3.67	0.32	-54.7	-239.9	1.60	0.08 ^a	1.7	1.2
2-May-05	4.14	0.22	-23.8	-209.8	2.50	0.07 ^a	3.4	0.4
3-May-05	4.55	0.31	-2.2	-103.1	2.40	0.08 ^a	3.7	0.7
4-May-05	4.66	0.12	-12.7	-153.6	2.10	0.00	2.9	0.0
6-May-05	5.27	0.32	7.9	-131.6	1.80	0.00	3.2	0.3
9-May-05	1.94	0.27	-84.7	-245.2	2.40	0.00	1.7	0.7
10-May-05	4.13	0.13	45.7	-140.7	2.00	0.00	4.4	0.5
11-May-05	4.22	0.31	-4.8	-157.8	1.80	0.00	1.5	0.2
16-May-05	2.50	0.21	-58.7	-297.0	2.30	0.00	4.6	0.5
17-May-05	3.88	0.24	15.1	-149.1	1.70	0.00	0.3	0.2
18-May-05	3.29	0.19	20.1	-132.9	1.70	0.00	1.9	0.3
19-May-05	4.40	0.38	64.9	-90.3	1.80	0.00	3.1	0.2
23-May-05	3.22	0.41	104.8	-26.4	1.80	0.00	–	–
24-May-05	3.08	0.19	60.5	-137.9	2.10	0.00	1.6	0.1
26-May-05	4.10	0.23	35.9	-103.0	2.00	0.51	0.4	0.8
31-May-05	3.92	0.26	101.0	34.8	1.50	0.48	1.5	0.6
1-Jun-05	4.11	0.20	25.1	-45.6	1.70	0.56	3.2	–
2-Jun-05	5.96	0.16	-13.7	-49.2	1.70	0.62	3.2	0.8
3-Jun-05	3.28	0.12	109.1	1.2	1.60	0.27	3.0	–
6-Jun-05	4.09	0.22	79.9	-81.3	1.50	0.13	2.7	–
7-Jun-05	3.56	0.17	-13.9	-10.3	1.90	0.13	3.7	0.6
8-Jun-05	5.37	0.16	90.4	48.6	1.60	0.11	2.7	–
9-Jun-05	4.89	0.24	1.2	-17.3	1.60	0.13	3.5	0.6
13-Jun-05	4.43	0.11	7.8	-51.9	1.60	0.13	3.9	–
14-Jun-05	5.20	0.13	8.1	46.5	1.70	0.19	1.5	0.3

Table A-1. OU-1 On Site Water Quality Log Comparison Sheet FBR Influent and Effluent

Date	DO In	DO Out	ORP In	ORP Out	ClO4 In ^a	ClO4 Out ^a	Nitrate-N In	Nitrate-N Out
d/m/y	mg/L	mg/L	mV	mV	mg/L	mg/L	mg/L	mg/L
15-Jun-05	5.38	0.15	5.1	-76.8	1.60	0.14	4.3	–
16-Jun-05	7.12	0.32	-79.7	-101.5	1.60	0.09 ^a	4.0	0.1
17-Jun-05	5.09	0.12	13.8	95.4	1.30	0.06 ^a	2.5	–
20-Jun-05	4.10	0.18	129.5	157.6	1.40	0.08 ^a	1.7	–
21-Jun-05	4.62	0.12	67.1	94.3	1.60	0.03 ^a	3.0	0.2
22-Jun-05	4.27	0.20	-36.9	-114.4	1.30	0.00	3.4	–
23-Jun-05	4.56	0.18	33.3	-101.5	1.60	0.00	1.8	0.1
27-Jun-05	5.05	0.17	21.1	-109.4	1.30	0.00	3.1	–
28-Jun-05	5.63	0.22	85.4	-143.4	1.60	0.00	2.1	0.1
29-Jun-05	5.87	0.16	73.2	-158.2	1.30	0.00	2.7	–
30-Jun-05	5.18	0.39	88.5	54.8	1.40	0.00	1.6	0.6
5-Jul-05	5.58	0.16	99.6	-297.6	1.30	0.00	2.5	0.0
7-Jul-05	0.00	0.45	0.0	-320.1	0.00	0.00	0.0	NA
8-Jul-05	0.00	0.37	0.0	-422.7	0.00	0.00	0.0	0.0
11-Jul-05	3.31	0.12	245.2	175.8	1.50	0.00	4.2	0.0
12-Jul-05	0.00	0.28	0.0	-333.1	0.00	0.00	0.0	1.1
13-Jul-05	3.84	0.25	-41.3	-337.6	1.20	0.00	3.3	0.8
14-Jul-05	3.20	0.17	-92.5	-332.7	0.62	0.00	2.6	0.2
18-Jul-05	3.91	0.23	-78.4	-334.6	1.20	0.00	1.7	–
19-Jul-05	3.66	0.20	-25.3	-318.3	1.10	0.00	2.7	0.3
20-Jul-05	4.62	0.14	136.0	-77.3	0.75	0.00	2.2	–
21-Jul-05	5.09	0.76	2.7	-140.9	1.10	0.00	1.3	0.3
22-Jul-05	5.11	0.27	21.5	-273.5	0.50	0.00	0.7	–
25-Jul-05	5.86	0.24	-29.8	-313.8	1.10	0.00	2.6	–
26-Jul-05	5.55	0.62	62.5	-99.1	1.10	0.00	2.1	0.7
27-Jul-05	5.28	0.28	-49.6	-328.1	1.10	0.00	3.4	–
28-Jul-05	5.03	0.42	-12.6	-326.9	0.64	0.00	3.2	0.8
29-Jul-05	5.86	0.21	112.2	-229.1	1.10	0.00	0.8	–
1-Aug-05	5.48	0.31	92.9	-253.4	1.20	0.00	2.7	–
3-Aug-05	4.29	0.21	-143.5	-227.0	1.40	0.00	–	–
4-Aug-05	3.09	0.45	-151.5	-252.0	1.30	0.00	2.9	0.2
5-Aug-05	4.97	0.41	13.5	-234.0	0.48	0.00	1.6	–
8-Aug-05	6.06	0.35	57.4	-206.9	0.64	0.00	0.6	–
9-Aug-05	5.64	0.42	90.6	-189.5	0.49	0.00	3.0	0.7
11-Aug-05	4.24	0.12	293.7	-225.8	0.86	0.00	2.2	0.5
12-Aug-05	5.38	0.31	65.2	-181.8	0.46	0.00	2.3	–
15-Aug-05	6.54	0.28	110.0	-184.3	0.12	0.00	3.2	–
16-Aug-05	6.24	0.41	81.5	-241.5	0.13	0.00	2.2	0.8
17-Aug-05	5.20	0.39	48.4	-235.5	–	–	3.2	–
18-Aug-05	4.78	0.33	48.7	-234.5	0.24	0.03 ^a	3.0	0.5
19-Aug-05	4.53	–	48.5	-222.0	–	–	–	–
22-Aug-05	4.13	0.32	43.6	-246.6	0.21	0.07 ^a	3.5	–

Table A-1. OU-1 On Site Water Quality Log Comparison Sheet FBR Influent and Effluent

Date	DO In	DO Out	ORP In	ORP Out	ClO4 In ^a	ClO4 Out ^a	Nitrate-N In	Nitrate-N Out
d/m/y	mg/L	mg/L	mV	mV	mg/L	mg/L	mg/L	mg/L
23-Aug-05	4.71	0.32	30.5	-246.2	0.31	0.05 ^a	3.0	0.3
24-Aug-05	4.18	0.22	30.9	-248.1	0.29	0.03 ^a	2.8	-
25-Aug-05	4.58	0.08	19.7	-297.8	0.30	0.08 ^a	0.9	0.0
26-Aug-05	4.59	0.28	22.8	-269.5	0.31	0.05 ^a	1.0	-
29-Aug-05	4.48	0.25	-10.9	-300.3	0.28	0.06 ^a	-	-
30-Aug-05	4.78	0.26	69.3	-283.9	0.19	0.14	3.1	0.6
31-Aug-05	5.11	0.45	40.5	-271.8	0.21	0.08 ^a	4.2	-

Note:

(a) Ion selective probe has a >0.1 mg/L quantitation limit for perchlorate. The field probe results are biased high compared to laboratory data.

(b) A dash signifies parameters that were not read.

Table A-2. OU-1 On Site Water Quality Log Sheet FBR Effluent

Date	Time	PH	Temperature	Conductivity	DO	ORP	ClO ₄ ^a	Sulfide ^b	Nitrate-N	Nitrite-N	Sulfate	Ammonia-N	PO ₄ ^c	Filtered TOC
d/m/y			°C	µS/cm	mg/L	mV	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
01-Apr-05	1900	6.09	20.4	515	0.30	38.4	0.06 ^a	-	0.0	-	-	-	-	-
04-Apr-05	1800	6.08	20.3	513	0.22	-56.2	0.07 ^a	127	0.0	0.0	45	1.80	1.16	<15
05-Apr-05	1700	5.87	21.2	485	0.91	39.0	0.05 ^a	-	0.1	-	-	-	-	-
06-Apr-05	1900	5.91	20.9	489	0.34	12.3	0.03 ^a	11	0.2	-	46	-	-	<15
07-Apr-05	1130	6.02	20.5	508	0.22	25.1	0.06 ^a	31	0.0	0.0	40	1.40	0.86	<15
11-Apr-05	1030	6.23	20.3	526	0.29	-25.2	0.07 ^a	93	0.1	0.0	48	1.30	1.09	<15
12-Apr-05	1530	6.16	21.6	541	0.37	4.4	0.07 ^a	-	0.0	-	-	-	-	-
13-Apr-05	1800	6.24	20.4	529	0.67	17.4	0.07 ^a	-	0.1	-	-	-	-	-
14-Apr-05	1800	6.26	21.0	527	0.38	2.5	0.07 ^a	13	0.1	0.0	46	1.60	1.33	0.7
18-Apr-05	1430	6.36	19.6	529	0.27	-55.4	0.07 ^a	21	0.1	0.0	49	1.40	1.36	0.0
20-Apr-05	1700	6.30	20.8	532	0.25	-38.1	0.08 ^a	-	0.0	-	-	-	-	-
21-Apr-05	2000	6.33	20.3	532	0.23	-25.4	0.08 ^a	164	0.0	0.0	41	0.12	-	2.9
25-Apr-05	1700	6.28	20.5	522	0.27	-108.2	0.07 ^a	81	0.1	0.0	45	9.00	1.24	19.9
26-Apr-05	1700	6.37	20.8	530	0.20	85.9	0.09 ^a	-	0.0	-	-	-	-	-
27-Apr-05	1700	6.43	19.8	530	0.21	-28.3	0.07 ^a	-	-	-	-	-	-	-
30-Apr-05	1700	6.19	20.5	540	0.32	-239.9	0.08 ^a	249	1.2	0.0	47	2.90	2.00	2.1
02-May-05	1700	6.40	20.7	536	0.22	-209.8	0.07 ^a	45	0.4	0.0	40	1.70	1.80	1.5
03-May-05	1700	6.50	21.0	531	0.31	-103.1	0.08 ^a	-	0.7	-	-	-	-	-
04-May-05	1800	6.58	21.1	531	0.12	-153.6	0.00	-	0.0	-	-	-	-	-
06-May-05	2100	6.45	19.5	531	0.32	-131.6	0.00	42	0.3	0.0	46	1.30	1.90	2.1
09-May-05	1400	6.34	19.9	544	0.27	-245.2	0.00	124	0.7	0.0	47	2.20	0.04	2.7
10-May-05	1300	6.31	20.6	529	0.13	-140.7	0.00	-	0.5	-	-	-	-	-
11-May-05	1600	6.37	21.3	537	0.31	-157.8	0.00	-	0.2	-	-	-	-	-
16-May-05	1500	6.19	20.5	552	0.21	-297.0	0.00	247	0.5	-	41	1.90	0.20	1.7
17-May-05	1500	6.50	20.2	539	0.24	-149.1	0.00	-	0.2	-	-	-	-	1.1
18-May-05	1530	6.43	21.5	544	0.19	-132.9	0.00	46	0.3	-	-	-	-	-
19-May-05	1830	6.36	22.2	545	0.38	-90.3	0.00	47	0.2	0.0	40	1.50	1.70	1.7
23-May-05	1800	6.62	22.1	549	0.41	-26.4	0.00	-	-	-	-	-	-	1.3
24-May-05	1800	6.65	21.3	563	0.19	-137.9	0.00	28	0.1	0.0	41	1.50	1.58	2.1
26-May-05	1900	6.61	21.2	587	0.23	-103.0	0.51	35	0.8	0.0	39	OR	7.80	1.6
31-May-05	1000	6.22	20.2	534	0.26	34.8	0.48	60	0.6	0.1	40	1.20	1.47	0.8
01-Jun-05	920	6.26	19.3	535	0.20	-45.6	0.56	-	-	-	-	-	-	-
02-Jun-05	1720	6.24	20.1	535	0.16	-49.2	0.62	24	0.8	0.3	43	1.10	1.51	3.4
03-Jun-05	935	6.25	20.3	535	0.12	1.2	0.27	-	-	-	-	-	-	-
06-Jun-05	1010	6.25	20.2	532	0.22	-81.3	0.13	-	-	-	-	-	-	-
07-Jun-05	1350	5.78	21.1	531	0.17	-10.3	0.13	51	0.6	0.0	42	1.10	1.50	3.4
08-Jun-05	900	6.19	19.8	530	0.16	48.6	0.11	-	-	-	-	-	-	-
09-Jun-05	1640	6.16	20.3	532	0.24	-17.3	0.13	33	0.6	0.3	40	0.13	1.24	3.3
13-Jun-05	1440	6.14	21.7	529	0.11	-51.9	0.13	-	-	-	-	-	-	-
14-Jun-05	930	6.16	19.7	526	0.13	46.5	0.19	27	0.3	0.2	42	1.00	1.51	6.4
15-Jun-05	930	6.42	19.3	527	0.15	-76.8	0.14	-	-	-	-	-	-	-
16-Jun-05	845	6.43	19.4	527	0.32	-101.5	0.09 ^a	80	0.1	0.0	38	0.70	1.22	3.2
17-Jun-05	1115	6.41	19.8	528	0.12	95.4	0.06 ^a	-	-	-	-	-	-	-
20-Jun-05	1040	6.38	20.3	527	0.18	157.6	0.08 ^a	-	-	-	-	-	-	-
21-Jun-05	830	6.44	19.4	523	0.12	94.3	0.03 ^a	1	0.2	0.0	41	0.50	1.36	6.7
22-Jun-05	945	6.15	20.6	527	0.20	-114.4	0.00	-	-	-	-	-	-	-
23-Jun-05	1050	6.32	20.7	524	0.18	-101.5	0.00	22	0.1	0.0	42	1.10	1.22	4.7
27-Jun-05	1535	6.17	21.0	523	0.17	-109.4	0.00	-	-	-	-	-	-	-
28-Jun-05	930	6.21	19.7	522	0.22	-143.4	0.00	6	0.1	0.0	54	0.10	1.30	7.1
29-Jun-05	1700	6.06	21.5	5220	0.16	-158.2	0.00	-	-	-	-	-	-	-
30-Jun-05	900	6.14	19.8	521	0.39	54.8	0.00	21	0.6	0.0	47	0.60	1.42	8.5
05-Jul-05	1820	6.07	20.9	496	0.16	-297.6	0.00	81	0.0	0.0	40	0.70	1.24	4.3
07-Jul-05	1540	5.92	24.9	571	0.45	-320.1	0.00	534	-1.4	0.0	26	4.40	2.71	-
08-Jul-05	1330	5.91	27.2	622	0.37	-422.7	0.00	over	0.0	0.0	1	over	3.40	-
11-Jul-05	1015	6.26	20.5	531	0.12	175.8	0.00	12	0.0	0.0	43	1.90	1.25	7.0
12-Jul-05	1500	5.95	26.7	633	0.28	-333.1	0.00	over	1.1	0.0	27	3.60	1.78	-
13-Jul-05	1725	6.21	23.1	518	0.25	-337.6	0.00	-	0.8	0.0	47	0.90	1.82	6.3
14-Jul-05	1930	6.35	21.7	524	0.17	-332.7	0.00	106	0.2	-	-	-	-	-
18-Jul-05	1540	6.32	22.1	520	0.23	-334.6	0.00	-	-	-	-	-	-	-
19-Jul-05	1345	6.34	22.1	521	0.20	-318.3	0.00	33	0.3	0.0	43	1.10	1.22	4.1
20-Jul-05	940	6.33	21.0	525	0.14	-77.3	0.00	-	-	-	-	-	-	-
21-Jul-05	730	6.32	20.1	524	0.76	-140.9	0.00	40	0.3	0.0	43	1.60	1.42	4.6
22-Jul-05	1205	6.32	21.7	523	0.27	-273.5	0.00	-	-	-	-	-	-	-
25-Jul-05	1030	6.44	20.3	523	0.24	-313.8	0.00	-	-	-	-	-	-	-
26-Jul-05	1000	6.37	20.4	525	0.62	-99.1	0.00	47	0.7	0.0	44	0.90	1.26	3.7
27-Jul-05	1415	6.43	21.8	525	0.28	-328.1	0.00	173	-	-	-	-	-	-
28-Jul-05	1600	6.38	22.1	524	0.42	-326.9	0.00	39	0.8	0.0	44	1.30	1.37	5.9

Table A-2. OU-1 On Site Water Quality Log Sheet FBR Effluent

Date	Time	PH	Temperature	Conductivity	DO	ORP	ClO ₄ ^a	Sulfide ^b	Nitrate-N	Nitrite-N	Sulfate	Ammonia-N	PO ₄ ^c	Filtered TOC
d/m/y			°C	µS/cm	mg/L	mV	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
29-Jul-05	1250	6.40	21.4	527	0.21	-229.1	0.00	-	-	-	-	-	-	-
01-Aug-05	1115	6.34	21.2	525	0.31	-253.4	0.00	-	-	-	-	-	-	-
03-Aug-05	1600	6.35	21.1	524	0.21	-227.0	0.00	-	-	-	-	-	-	-
04-Aug-05	1330	6.33	21.0	525	0.45	-252.0	0.00	138	0.2	0.0	44	over	1.27	6.4
05-Aug-05	1515	6.32	22.3	520	0.41	-234.0	0.00	-	-	-	-	-	-	-
08-Aug-05	930	6.35	20.7	526	0.35	-206.9	0.00	-	-	-	-	-	-	-
09-Aug-05	735	6.30	19.8	525	0.42	-189.5	0.00	26	0.7	0.0	42	1.40	1.13	3.8
10-Aug-05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11-Aug-05	1450	6.20	21.3	525	0.12	-225.8	0.00	46	0.5	0.0	41	0.60	1.30	4.5
12-Aug-05	900	6.27	20.7	525	0.31	-181.8	0.00	-	-	-	-	-	-	-
15-Aug-05	750	6.21	19.5	524	0.28	-184.3	0.00	-	-	-	-	-	-	-
16-Aug-05	940	6.22	19.5	515	0.41	-241.5	0.00	141	0.8	0.0	41	0.00	0.48	3.4
17-Aug-05	900	6.20	19.6	518	0.39	-235.5	-	-	-	-	-	0.00	0.49	-
18-Aug-05	1600	6.27	20.6	521	0.33	-234.5	0.03 ^a	24	0.5	0.0	43	0.40	1.00	3.7
19-Aug-05	1100	-	-	-	-	-222.0	-	-	-	-	-	-	-	-
22-Aug-05	1640	6.23	22.2	561	0.32	-246.6	0.07 ^a	-	-	-	-	-	-	-
23-Aug-05	1430	6.14	21.2	531	0.32	-246.2	0.05 ^a	129	0.3	0.0	41	1.70	2.10	4.1
24-Aug-05	1725	6.12	21.9	528	0.22	-248.1	0.03 ^a	-	-	-	-	-	-	-
25-Aug-05	1720	6.20	21.8	527	0.08	-297.8	0.08 ^a	60	0.0	0.0	33	0.80	1.44	3.8
26-Aug-05	1100	6.18	21.7	530	0.28	-269.5	0.05 ^a	-	-	-	-	-	-	-
29-Aug-05	1830	6.15	21.8	532	0.25	-300.3	0.06 ^a	-	-	-	-	-	-	-
30-Aug-05	1700	6.90	22.1	524	0.26	-283.9	0.14	336	0.6	0.0	39	0.40	1.32	4.4
31-Aug-05	1730	6.78	22.0	526	0.45	-271.8	0.08 ^a	-	-	-	-	-	-	-

Note:

(a) Ion selective probe has a >0.1 ppm quantitation limit for perchlorate. The field probe results are biased high compared to laboratory data.

(b) For the Hach™ methylene blue colorimetric method for total sulfide, the range is 2 to 800 ppb.

(c) For the Hach™ PhosVer3 Asorbic Acid method, the range is 0.03 to 2.5 mg/L for orthophosphate

(d) A dash signifies parameters that were not read.

Attachment B
Laboratory Analytical Results

Table B-1. Laboratory Analytical Data OU-1 Treatment System - April

Sampling Date		04/06/2005					04/12/2005						04/21/2005						04/28/2005							
Sample Locations		EW-1	GACIN	GACMID	FBR Inlet	FBR Outlet	EW-1	EW-2	GACIN	GACMID	FBR Inlet	FBR Outlet	EW-1	EW-2	GACIN	GACMID	FBR Inlet	FBR Outlet	EW-1	EW-2	GACIN	GACMID	FBR Inlet	FBR Outlet	Trinitite Inlet	Trinitite Outlet
Conductivity	µS/cm	540	520	–	540	500	530	530	520	–	530	520	530	500	520	–	530	520	540	530	520	–	540	530	–	–
Perchlorate	µg/L	1,800	1,400	–	1,400	<.5	1,700	1,100	1,400	–	1,500	<.5	1,600	1,100	1,300	–	1,600	<.5	1,600	1,200	1,300	–	1,000	<.5	–	–
Nitrite	mg/L	< .25	< .25	–	< .25	< .25	< .25	< .25	< .25	–	< .25	< .25	< .25	< .25	< .25	–	< .25	< .25	<.25	<.25	<.25	–	<.25	<.25	–	–
Nitrate	mg/L	8.5	6.9	–	6.4	< .25	7.4	5.1	6.1	–	5.6	< .25	7.6	5.1	6.2	–	5.7	< .25	7.3	5.0	6.0	–	4.3	< .25	–	–
Sulfate	mg/L	55	49	–	50	50	51	42	46	–	46	46	53	42	47	–	49	47	53	43	48	–	47	46	–	–
Chlorate	mg/L	<.5	<.5	–	<.5	<.5	<.5	<.5	<.5	–	<.5	<.5	<.5	<.5	<.5	–	<.5	<.5	<.5	<.5	<.5	–	<.5	<.5	–	–
Chloride	mg/L	–	–	–	–	–	28	29	28	–	29	29	29	29	29	–	28	29	31	30	29	–	29	30	–	–
Sulfide	mg/L	–	–	–	<.10	<.10	–	–	–	–	<.10	<.10	–	–	–	–	0.12	0.11	–	–	–	–	0.22	0.47	–	–
TOC	mg/L	–	–	–	–	1.6	–	–	–	–	–	4.3	–	–	–	–	–	6.6	–	–	–	–	–	6.7	–	–
TKN	mg/L	–	–	–	0.80	3.0	–	–	–	–	1.0	2.2	–	–	–	–	2.2	4.4	–	–	–	–	4.0	5.2	–	–
Phosphorus	mg/L	0.16	< .10	–	0.13	0.35	0.15	< .10	< .10	–	0.14	0.32	0.21	0.20	0.23	–	0.35	0.40	0.13	0.12	0.17	–	0.66	0.80	–	–
Alkalinity	mg/L	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	160	–	–	–	180	180	
TDS	mg/L	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	310	–	–	–	310	310	
TSS	mg/L	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	<4.0	–	–	–	56	<4.0
Turbidity	NTU	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.17	–	–	–	7.6	0.42
BOD	mg/L	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	<3.0	–	–	–	–	<3.0
COD	mg/L	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	<5.0	–	–	–	–	<5.0
1,1-Dichloroethane	µg/L	1.2	1.7	< 1.0	< 1.0	–	1.7	1.7	1.8	< 1.0	< 1.0	–	1.3	1.6	1.5	< 1.0	< 1.0	–	1.5	1.7	1.6	< 1.0	< 1.0	–	–	–
Chloroform	µg/L	6.2	7.1	< 1.0	< 1.0	–	7.3	7.9	7.5	< 1.0	< 1.0	–	5.3	6.9	6.2	< 1.0	< 1.0	–	6.0	7.4	6.7	< 1.0	< 1.0	–	–	–
Carbon Tetrachloride	µg/L	20	35	< 1.0	< 1.0	–	33	52	43	< 1.0	< 1.0	–	19	39	30	< 1.0	< 1.0	–	22	44	34	< 1.0	< 1.0	–	–	–
Trichloroethene	µg/L	4.3	6.6	< 1.0	< 1.0	–	5.8	9.0	7.6	< 1.0	< 1.0	–	4.1	7.6	6.0	< 1.0	< 1.0	–	4.2	7.5	6.0	< 1.0	< 1.0	–	–	–
Tetrachloroethene	µg/L	3.6	3.8	< 1.0	< 1.0	–	5.6	5.0	5.1	< 1.0	< 1.0	–	3.7	3.6	3.5	< 1.0	< 1.0	–	3.8	3.7	3.8	< 1.0	< 1.0	–	–	–
Total VOC's	µg/L	35.3	54.2	–	–	–	53.4	75.6	65.0	–	–	–	33.4	58.7	47.2	–	–	–	37.5	64.3	52.1	–	–	–	–	–
Toluene	µg/L				<0.5						<0.5						1.1						57			
1,4-Dioxane	µg/L	7.4	3.3	8.5	< 3.0	–	< 3.0	4.8	3.2	7.9	< 3.0	–	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	–	<3.0	<3.0	< 3.0	< 3.0	< 3.0	–	–	–

Table B-1. Laboratory Analytical Data OU-1 Treatment System - May

Sampling Date		05/05/2005						05/12/2005						05/19/2005						05/26/2005								
Sample Locations		EW-1	EW-2	GACIN	GACMID	FBR Inlet	FBR Outlet	EW-1	EW-2	GACIN	GACMID	FBR Inlet	FBR Outlet	EW-1	EW-2	GACIN	GACMID	FBR Inlet	FBR Outlet	EW-1	EW-2	GACIN	GACMID	FBR Inlet	FBR Outlet	Trime Inlet	Trime Outlet	
Parameter	Unit	530	530	520	-	530	520	540	530	510	-	540	510	550	550	530	-	540	550	530	550	540	-	540	590	-	-	
Conductivity	µS/cm	1,600	1,100	1,300	-	1,300	<5	1,500	1,000	1,200	-	1,100	<5	1,400	1,000	1,200	-	1,300	<5	1,300	960	1,100	-	1,300	520	-	-	
Perchlorate	µg/L	< .25	< .25	< .25	-	< .25	<25	< .25	< .25	< .25	-	< .25	< .25	< .25	< .25	< .25	-	< .25	< .25	<25	<25	<25	-	<25	<25	-	-	
Nitrite	mg/L	7.2	5.0	5.9	-	5.3	<25	7.1	5.0	5.9	-	4.5	0.66	7.0	5.0	5.9	-	5.9	1.3	6.8	5.0	5.8	-	5.8	< .25	-	-	
Nitrate	mg/L	53	43	47	-	47	47	53	43	47	-	47	48	53	43	47	-	48	47	53	44	48	-	48	48	-	-	
Sulfate	mg/L	<5	<5	<5	-	<5	<5	<5	<5	<5	-	<5	<5	<5	<5	<5	-	<5	<5	<5	<5	<5	-	<5	<5	-	-	
Chlorate	mg/L	28	29	-	29	29	29	28	29	28	-	29	29	28	29	28	-	28	29	-	-	-	-	-	-	-	-	
Chloride	mg/L	-	-	-	-	<10	0.10	-	-	-	-	0.16	<10	-	-	-	-	<10	<10	-	-	-	-	<10	<10	-	-	
Sulfide	mg/L	-	-	-	-	-	3.3	-	-	-	-	-	<1.0	-	-	-	-	-	<1.0	-	-	-	-	-	1.4	-	-	
TOC	mg/L	-	-	-	-	-	1.3	2.2	-	-	-	1.7	1.2	-	-	-	-	0.28	0.84	-	-	-	-	1.5	8.5	-	-	
TKN	mg/L	0.21	0.16	0.18	-	0.33	0.52	0.15	0.17	0.17	-	0.62	0.76	0.16	0.18	0.13	-	0.13	0.51	0.18	0.17	0.15	-	0.53	2.2	-	-	
Phosphorus	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	170	-	-	-	220	210	
Alkalinity	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	320	-	-	-	320	320	
TDS	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<4.0	-	-	-	28	4.0	
TSS	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<4.0	-	-	-	28	4.0	
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.13	-	-	-	0.50	0.16	
BOD	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<3.0	-	-	-	-	<3.0	
COD	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<5.0	-	-	-	7.6	5.4	
1,1-Dichloroethane	µg/L	1.4	1.7	1.5	<1.0	<1.0	-	1.4	1.8	1.9	<1.0	<1.0	-	1.5	1.9	1.6	<1.0	<1.0	-	1.3	1.9	1.7	<1.0	<1.0	-	-	-	
Chloroform	µg/L	5.4	7.0	6.3	<1.0	<1.0	-	5.2	7.2	6.7	<1.0	<1.0	-	4.8	6.7	6.0	<1.0	<1.0	-	4.8	7.4	6.4	<1.0	<1.0	-	-	-	
Carbon Tetrachloride	µg/L	21	45	34	<1.0	<1.0	-	20	42	36	<1.0	<1.0	-	19	43	32	<1.0	<1.0	-	21	46	37	<1.0	<1.0	-	-	-	
Trichloroethene	µg/L	3.8	6.9	5.4	<1.0	<1.0	-	4.4	7.9	6.6	<1.0	<1.0	-	4.3	7.5	6.2	<1.0	<1.0	-	4.3	7.8	6.5	<1.0	<1.0	-	-	-	
Tetrachloroethene	µg/L	4.2	4.3	4.2	<1.0	<1.0	-	3.6	3.8	3.9	<1.0	<1.0	-	3.8	3.9	4.0	<1.0	<1.0	-	3.1	3.8	3.7	<1.0	<1.0	-	-	-	
Total VOC's	µg/L	35.8	64.9	51.4	-	-	-	34.6	62.7	55.1	-	-	-	33.4	63.0	49.8	-	-	-	34.5	66.9	55.3	-	-	-	-	-	
Toluene	µg/L					9.1						38						<0.5						0.54				
1,4-Dioxane	µg/L	<3.0	<3.0	<3.0	<3.0	<3.0	-	<3.0	<3.0	<3.0	<3.0	<3.0	-	<3.0	<3.0	<3.0	<3.0	<3.0	-	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	-	-

Table B-1. Laboratory Analytical Data OU-1 Treatment System - June																															
Sampling Date		06/02/2005						06/09/2005						06/16/2005						06/23/2005						06/29/2005					
Sample Locations		EW-1	EW-2	GACIN	GACMID	FBR Inlet	FBR Outlet	EW-1	EW-2	GACIN	GACMID	FBR Inlet	FBR Outlet	EW-1	EW-2	GACIN	GACMID	FBR Inlet	FBR Outlet	EW-1	EW-2	GACIN	GACMID	FBR Inlet	FBR Outlet	EW-1	EW-2	GACIN	GACMID	FBR Inlet	FBR Outlet
Parameter	Unit	520	520	530	-	530	510	520	530	530	-	530	520	520	520	520	-	510	510	520	530	520	-	520	510	510	530	530	-	530	520
Conductivity	µS/cm	520	520	530	-	530	510	520	530	530	-	530	520	520	520	520	-	510	510	520	530	520	-	520	510	510	530	530	-	530	520
Perchlorate	µg/L	1,300	940	1,100	-	1,200	610	1,200	890	990	-	1,200	410	1,200	970	1,100	-	1,200	450	970	850	920	-	1,100	<2.0	950	820	890	-	1,000	<1.0
Nitrite	mg/L	< .25	< .25	< .25	-	< .25	< .25	< .25	< .25	< .25	-	< .25	< .25	<0.25	<0.25	<0.25	-	<0.25	<0.25	<0.25	<0.25	<0.25	-	<0.25	<0.25	<.25	<.25	<.25	-	<.25	<.25
Nitrate	mg/L	6.6	4.9	5.6	-	5.0	1.4	6.3	4.8	5.4	-	5.3	1.4	6.2	4.6	5.3	-	4.7	0.82	6.0	4.6	5.3	-	4.8	0.59	5.8	4.4	5.0	-	4.5	0.6
Sulfate	mg/L	53	44	48	-	50	46	53	44	48	-	48	46	53	44	48	-	48	48	54	46	49	-	49	50	54	45	48	-	50	53
Chlorate	mg/L	<.5	<.5	<.5	-	<.5	<.5	<.5	<.5	<.5	-	<.5	<.5	<.5	<.5	<.5	-	<.5	<.5	<.5	<.5	<.5	-	<.5	<.5	<.5	<.5	<.5	-	<.5	<.5
Chloride	mg/L	27	29	28	-	28	28	27	28	28	-	27	27	27	28	27	-	28	28	27	28	28	-	28	29	27	28	27	-	28	29
Sulfide	mg/L	-	-	-	-	<.10	<.10	-	-	-	-	<.20	<.20	-	-	-	-	<0.20	<0.20	-	-	-	-	<0.20	<0.20	-	-	-	-	<.20	<.20
TOC	mg/L	-	-	-	-	-	<1.0	-	-	-	-	-	<1.0	-	-	-	-	-	<1.0	-	-	-	-	-	1.2	-	-	-	-	-	<1.0
TKN	mg/L	-	-	-	-	1.1	0.68	-	-	-	-	0.84	1.5	-	-	-	-	0.91	0.49	-	-	-	-	0.68	0.25	-	-	-	-	0.94	0.25
Phosphorus	mg/L	0.26	0.27	0.27	-	0.38	0.59	0.18	0.21	0.18	-	0.25	0.44	0.37	0.33	0.28	-	0.38	0.75	0.22	0.22	0.24	-	0.33	0.65	<.10	0.12	<.10	-	0.37	0.17
Alkalinity	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	170	-	180	180	-	-	-	-	-	-
TDS	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	330	-	310	310	-	-	-	-	-	-
TSS	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<4.0	-	17	9.0	-	-	-	-	-	-
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.10	-	1.1	<0.10	-	-	-	-	-	-
BOD	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<3.0	-	-	<3.0	-	-	-	-	-	-
COD	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.2	-	-	12	-	-	-	-	-	-
1,1-Dichloroethane	µg/L	1.1	1.6	1.4	< 1.0	< 1.0	-	1.0	1.8	1.4	<1.0	<1.0	-	<1.0	1.6	1.3	<1.0	<1.0	-	<1.0	1.5	1.2	<1.0	<1.0	-	< 1.0	1.3	1.1	< 1.0	< 1.0	-
Chloroform	µg/L	3.6	5.3	4.7	< 1.0	< 1.0	-	3.6	6.0	4.8	<1.0	<1.0	-	3.6	5.8	4.8	<1.0	<1.0	-	3.2	5.9	4.7	<1.0	<1.0	-	2.5	4.5	3.8	< 1.0	< 1.0	-
Carbon Tetrachloride	µg/L	14	33	25	< 1.0	< 1.0	-	14	38	26	<1.0	<1.0	-	14	37	27	<1.0	<1.0	-	11	33	<1.0	<1.0	<1.0	-	7.9	25	21	< 1.0	< 1.0	-
Trichloroethene	µg/L	3.5	6.2	5.0	< 1.0	< 1.0	-	3.7	7.0	5.3	<1.0	<1.0	-	3.4	6.4	5.1	<1.0	<1.0	-	3.4	7.0	5.6	<1.0	<1.0	-	2.7	5.3	4.6	< 1.0	< 1.0	-
Tetrachloroethene	µg/L	3.1	3.8	3.6	< 1.0	< 1.0	-	2.7	4.2	3.3	<1.0	<1.0	-	2.3	3.7	3.0	<1.0	<1.0	-	1.8	3.5	2.8	<1.0	<1.0	-	1.5	3.0	2.6	< 1.0	< 1.0	-
Total VOC's	µg/L	25.3	49.9	39.7	-	-	-	25.0	57.0	40.8	-	-	-	23.3	54.5	41.2	-	-	-	19.4	50.9	14.3	-	-	-	14.6	39.1	33.1	-	-	-
Toluene	µg/L						1.1						3.0						4.7						6.1						3.0
1,4-Dioxane	µg/L	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	-	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	-	<3.0	<3.0	<3.0	<3.0	<3.0	-	<3.0	<3.0	<3.0	<3.0	<3.0	-	<3.0	<3.0	< 3.0	< 3.0	< 3.0	-

Table B-1. Laboratory Analytical Data OU-1 Treatment System - July

Table B-1. Laboratory Analytical Data OU-1 Treatment System - July																						
Sampling Date		07/14/2005						07/21/2005								07/28/2005						
Sample Locations		EW-1	EW-2	GACIN	GACMID	FBR Inlet	FBR Outlet	EW-1	EW-2	GACIN	GACMID	FBR Inlet	FBR Outlet	Trimate In	Trimate Out	EW-1	EW-2	GACIN	GACMID	FBR Inlet	FBR Outlet	
																						Parameter
Conductivity	µS/cm	500	520	520	–	510	500	510	520	520	–	520	510	–	–	510	520	520	–	520	510	
Perchlorate	µg/L	760	770	720	–	840	1.6J	750	690	710	–	780	<.5	–	–	730	640	670	–	730	<.5	
Nitrite	mg/L	<.25	<.25	<.25	–	<.25	<.25	<.25	<.25	<.25	–	<.25	<.25	–	–	<.25	<.25	<.25	–	<.25	<.25	
Nitrate	mg/L	5.5	4.2	4.7	–	3.4	0.75	5.1	4.0	4.5	–	4.0	0.67	–	–	5.1	4.0	4.5	–	4.0	0.76	
Sulfate	mg/L	53	46	49	–	49	51	53	45	48	–	49	50	–	–	53	45	49	–	49	49	
Chlorate	mg/L	<0.5	<0.5	<0.5	–	<0.5	<0.5	<0.5	<0.5	<0.5	–	<0.5	<0.5	–	–	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Chloride	mg/L	26	26	26	–	26	27	26	28	27	–	27	28	–	–	26	28	27	–	27	27	
Sulfide	mg/L	–	–	–	–	<.10	<.10	–	–	–	–	<.10	<.10	–	–	–	–	–	–	<.10	<.10	
TOC	mg/L	–	–	–	–	–	1.1	–	–	–	–	–	<1.0	–	–	–	–	–	–	–	<1.0	
TKN	mg/L	–	–	–	–	1.40	0.51	–	–	–	–	0.79	0.30	–	–	–	–	–	–	1.3	0.44	
Phosphorus	mg/L	0.25	0.21	0.25	–	0.51	0.43	0.36	0.25	0.26	–	0.41	0.69	–	–	0.11	<.10	0.20	–	0.20	0.42	
Alkalinity	mg/L	–	–	–	–	–	–	–	–	160	–	–	–	180	170	–	–	–	–	–	–	
TDS	mg/L	–	–	–	–	–	–	–	–	320	–	–	–	290	300	–	–	–	–	–	–	
TSS	mg/L	–	–	–	–	–	–	–	–	<4.0	–	–	–	6.0	<4.0	–	–	–	–	–	–	
Turbidity	NTU	–	–	–	–	–	–	–	–	<.10	–	–	–	1.4	<.10	–	–	–	–	–	–	
BOD	mg/L	–	–	–	–	–	–	–	–	<3.0	–	–	–	–	<3.0	–	–	–	–	–	–	
COD	mg/L	–	–	–	–	–	–	–	–	5.2	–	–	–	–	7.2	–	–	–	–	–	–	
1,1-Dichloroethane	µg/L	<1.0	1.0	<1.0	<1.0	<1.0	–	<1.0	1.3	1.0	<1.0	<1.0	–	–	–	<1.0	1.2	<1.0	<1.0	<1.0	–	
Chloroform	µg/L	2.2	4.0	3.4	<1.0	<1.0	–	2.3	4.5	3.7	<1.0	<1.0	–	–	–	1.8	3.9	3.2	<1.0	<1.0	–	
Carbon Tetrachloride	µg/L	7.3	22	19	<1.0	<1.0	–	7.4	26	20	<1.0	<1.0	–	–	–	4.2	20	15	<1.0	<1.0	–	
Trichloroethene	µg/L	2.6	4.9	4.5	<1.0	<1.0	–	2.7	5.3	4.5	<1.0	<1.0	–	–	–	2.0	4.3	3.5	<1.0	<1.0	–	
Tetrachloroethene	µg/L	1.3	2.5	2.3	<1.0	<1.0	–	1.1	2.7	2.3	<1.0	<1.0	–	–	–	–	2.5	2.0	<1.0	<1.0	–	
Total VOC's	µg/L	13.4	34.4	29.2	–	–	–	13.5	39.8	31.5	–	–	–	–	–	8.0	31.9	23.7	–	–	–	
Toluene	µg/L					0.53						<0.50									0.71	
1,4-Dioxane	µg/L	<3.0	<3.0	<3.0	<3.0	<3.0	–	<3.0	<3.0	<3.0	<3.0	<3.0	–	–	–	<3.0	<3.0	<3.0	<3.0	<3.0	–	

Table B-1. Laboratory Analytical Data OU-1 Treatment System - August																																	
Sampling Date		08/04/2005						08/10/2005						08/18/2005						08/25/2005						08/31/2005							
Sample Locations		EW-1	EW-2	GACIN	GACMID	FBR Inlet	FBR Outlet	EW-1	EW-2	GACIN	GACMID	FBR Inlet	FBR Outlet	EW-1	EW-2	GACIN	GACMID	FBR Inlet	FBR Outlet	Trimite Inlet	Trimite Outlet	EW-1	EW-2	GACIN	GACMID	FBR Inlet	FBR Outlet	EW-1	EW-2	GACIN	GACMID	FBR Inlet	FBR Outlet
Conductivity	µS/cm	500	510	510	–	500	500	500	520	510	–	510	500	520	530	510	–	510	510	–	–	510	530	520	–	530	520	510	520	520	–	540	510
Perchlorate	µg/L	620	620	640	–	750	<.5	640	630	610	–	640	<.5	590	610	630	–	630	<.5	–	–	540	630	590	–	590	<.5	520	650	600	–	610	<.5
Nitrite	mg/L	<.25	<.25	<.25	–	<.25	<.25	<.25	<.25	<.25	–	<.25	<.25	<.25	<.25	<.25	–	<.25	<.25	–	–	<.25	<.25	<.25	–	<.25	<.25	<.25	<.25	<.25	–	<.25	<.25
Nitrate	mg/L	5.2	3.8	4.5	–	3.9	0.98	5.0	3.9	4.3	–	4.0	0.72	4.8	3.8	4.2	–	3.9	<.25	–	–	4.7	3.7	4.2	–	3.7	<.25	4.5	3.7	4.0	–	3.6	<.25
Sulfate	mg/L	53	46	49	–	49	50	53	45	49	–	49	49	53	45	49	–	49	49	–	–	54	46	49	–	49	48	53	46	49	–	49	47
Chlorate	mg/L	<0.5	<0.5	<0.5	–	<0.5	<0.5	<0.5	<0.5	<0.5	–	<0.5	<0.5	<0.5	<0.5	<0.5	–	<0.5	<0.5	–	–	<0.5	<0.5	<0.5	–	<0.5	<0.5	<0.5	<0.5	<0.5	–	<0.5	<0.5
Chloride	mg/L	27	27	28	–	27	27	27	28	27	–	27	28	27	29	28	–	28	28	–	–	27	29	28	–	28	28	27	29	28	–	28	28
Sulfide	mg/L	–	–	–	–	<.10	<.10	–	–	–	–	0.19	<.10	–	–	–	–	<.10	0.34	–	–	–	–	–	–	<.10	1.2	–	–	–	–	<0.1	1.3
TOC	mg/L	–	–	–	–	–	<1.0	–	–	–	–	–	<1.0	–	–	–	–	–	1.2	–	–	–	–	–	–	–	5.3	–	–	–	–	–	1.6
TKN	mg/L	–	–	–	–	0.68	0.62	–	–	–	–	1.60	0.31	–	–	–	–	0.53	1.1	–	–	–	–	–	–	0.87	2.2	–	–	–	–	1.3	1.9
Phosphorus	mg/L	<.10	<.10	0.11	–	0.18	0.41	0.28	0.21	0.26	–	0.33	0.53	0.25	0.28	0.32	–	0.34	0.48	–	–	0.18	0.12	<.10	–	0.28	0.50	0.22	0.34	0.19	–	0.30	0.54
Alkalinity	mg/L	–	–	–	–	–	–	–	–	–	–	–	–	160	–	160	–	–	–	180	180	–	–	–	–	–	–	–	–	–	–	–	–
TDS	mg/L	–	–	–	–	–	–	–	–	–	–	–	–	–	–	310	–	–	–	310	310	–	–	–	–	–	–	–	–	–	–	–	–
TSS	mg/L	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7.0	–	–	–	110	<4.0	–	–	–	–	–	–	–	–	–	–	–	–
Turbidity	NTU	–	–	–	–	–	–	–	–	–	–	–	–	–	–	<.10	–	–	–	0.87	<.10	–	–	–	–	–	–	–	–	–	–	–	–
BOD	mg/L	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
COD	mg/L	–	–	–	–	–	–	–	–	–	–	–	–	–	–	<5.0	–	–	–	–	<5.0	–	–	–	–	–	–	–	–	–	–	–	–
1,1-Dichloroethane	µg/L	<1.0	1.2	<1.0	<1.0	<1.0	–	<1.0	1.5	<1.0	<1.0	<1.0	–	<1.0	1.3	<1.0	<1.0	<1.0	–	–	–	1.3	–	–	<1.0	–	<1.0	1.7	1.1	<1.0	<1.0	<1.0	<1.0
Chloroform	µg/L	2.3	4.2	3.4	<1.0	<1.0	–	2.2	4.6	3.4	3.3	<1.0	–	1.8	4.1	3.2	3.4	<1.0	–	–	–	2.0	4.1	3.1	3.6	<1.0	–	1.8	4.1	3.1	3.7	<1.0	<1.0
Carbon Tetrachloride	µg/L	7.5	26	20	<1.0	<1.0	–	7.2	31	20	10	<1.0	–	4.7	24	16	9.9	<1.0	–	–	–	5.2	28	17	12	<1.0	–	4.6	26	17	11	<1.0	<1.0
Trichloroethene	µg/L	2.9	5.1	4.2	<1.0	<1.0	–	2.8	5.3	4.1	<1.0	<1.0	–	2.1	4.4	3.4	<1.0	<1.0	–	–	–	2.3	4.8	3.6	–	<1.0	–	2.3	4.6	3.6	<1.0	<1.0	<1.0
Tetrachloroethene	µg/L	1.20	2.8	2.1	<1.0	<1.0	–	1.0	3.2	2.1	<1.0	<1.0	–	<1.0	2.2	1.5	<1.0	<1.0	–	–	–	–	3.0	2.0	–	<1.0	–	<1.0	2.9	2.0	<1.0	<1.0	<1.0
Total VOC's	µg/L	13.9	39.3	29.7	–	–	–	13.2	45.6	29.6	13.3	–	–	8.6	36.0	24.1	13.3	–	–	–	–	9.5	41.2	25.7	15.6	–	–	8.7	39.3	26.8	14.7	–	–
Toluene	µg/L	–	–	–	–	<0.5	–	–	–	–	–	<0.5	–	–	–	–	–	<0.5	–	–	–	–	–	–	–	–	–	–	–	–	<0.5	–	–
1,4-Dioxane	µg/L	<3.0	<3.0	<3.0	<3.0	<3.0	–	<3.0	<3.0	<3.0	<3.0	<3.0	–	<3.0	<3.0	<3.0	<3.0	<3.0	–	–	–	<3.0	<3.0	<3.0	<3.0	<3.0	–	<3.0	<3.0	<3.0	<3.0	<3.0	–

Table B-2. Summary of Laboratory Analytical for Metals

Sampling Date		02/03/2005			03/03/2005		04/28/2005		05/26/2005		07/21/2005		08/18/2005	
Sampling Location		GACIN	FBR Inlet	Trimite Outlet	GACIN	Trimite Outlet	GACIN	Trimite Outlet	GACIN	Trimite Outlet	GACIN	Trimite Outlet	GACIN	Trimite Outlet
Parameter	Unit													
Beryllium	mg/L	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	< 0.0040	<0.0040	<0.0040	<0.0040	<0.0040
Magnesium	mg/L	18	18	18	17	17	17	18	19	19	18	16	18	19
Calcium	mg/L	57	57	58	58	58	55	57	61	63	57	49	58	63
Vanadium	mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	<0.0030	<0.0030	<0.0030	<0.0030
Chromium	mg/L	< 0.0050	< 0.0050	< 0.0050	0.0056	< 0.0050	<0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Hexavalent Chromium	mg/L	< 1.0	-	< 1.0	2.6	< 1.0 ^a	4.0	<1.0	3.6	<1.0	2.7	<1.0	2.6	<1.0
Manganese	mg/L	0.031	0.023	< 0.010	0.012	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	<0.0050	<0.0050	<0.0050	<0.0050
Iron	mg/L	1.70	0.37	0.37	0.99	0.41	0.32	0.32	<.30	<.30	0.31	<.30	0.37	0.44
Cobalt	mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Nickel	mg/L	0.0057	0.010	0.0063	< 0.0050	0.023	< 0.0050	< 0.0050	< 0.0050	< 0.0050	<0.010	<0.010	<0.010	<0.010
Copper	mg/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	<0.010	<0.010	<0.010	<0.010
Zinc	mg/L	0.29	< 0.10	< 0.10	0.12	< 0.10	0.11	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Arsenic	mg/L	< 0.0050	0.0097	0.0120	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Selenium	mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Molybdenum	mg/L	0.0077	0.0052	0.0057	0.014	< 0.0050	0.011	0.0078	0.011	0.0066	< 0.0050	0.0068	0.0075	0.0093
Silver	mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Cadmium	mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Antimony	mg/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	0.0065	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Barium	mg/L	0.073	0.074	0.075	0.076	0.120	0.068	0.069	0.063	0.068	0.069	0.062	0.065	0.070
Mercury	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0050
Thallium	mg/L	< 0.0050	< 0.0050	< 0.0050	0.0078	< 0.0050	0.0130	< 0.0050	< 0.0050	< 0.0050	0.0078	<0.0020	<0.0020	<0.0020
Lead	mg/L	0.0110	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050

Note:

(a) Sample taken from FBR outlet.